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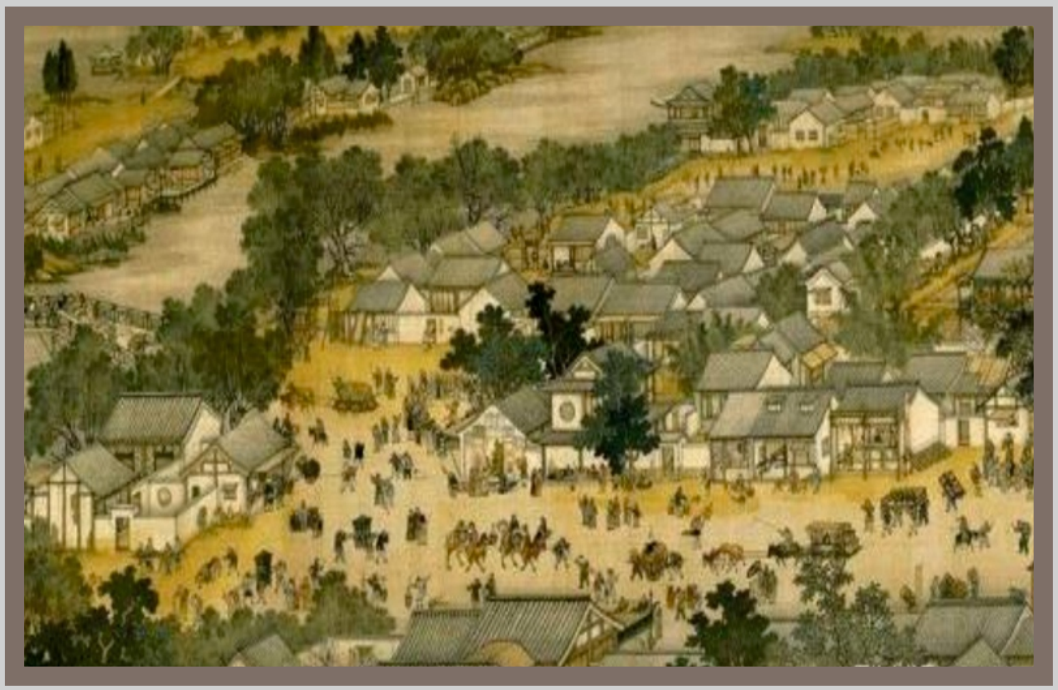
AGRARIAN CHANGE AND RURAL TRANSFORMATION:

CHINA'S DEVELOPMENT EXPERIENCE SINCE 1965



SRIRAM NATRAJAN

Agrarian Change and Rural Transformation: China's Development Experience Since 1965

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A Monograph by

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Foreword

The Institute of Chinese Studies is delighted to bring out this monograph titled *Agrarian Change and Rural Transformation: China's Development Experience Since 1965* by Dr. Sriram Natarajan, a seasoned scholar, economist and a keen observer of the agrarian sector in China since the past two decades.

Dr. Natarajan, who is also an Adjunct Fellow at the ICS, is among the few contemporary experts in this field and this monograph is based on his doctoral research at the Jawaharlal Nehru University in New Delhi. His investigations and research were amply supplemented with various stints of fieldwork in China over 2010-2012, and he has had extensive interactions with Chinese scholars and economists. The research presented in the chapters is of high quality, well supported by empirical evidence and is quite original in its analysis. This work has been adjudged as of high quality, which makes original conceptual and empirical contributions. Underpinning the author's analysis, are a number of tables and charts, testifying to his meticulous, painstaking and factually sound study.

There is not enough awareness or original research in India on the Chinese economy. Given the importance of the subject, it is also unfortunate that the standard works are also not very easily accessible. As two large developing economies facing similar challenges in the agrarian sector, both India and China urgently need to compare the developments and policies that are adopted by each other and learn from these experiences. A principal finding of this work is that the Maoist-era cannot be simply dismissed as an irrational mess and that while the post-Mao reforms brought about great gains in food/dietary diversification, these were not accompanied by any significant increase in grain consumption per capita. There are important political implications and lessons here for the scholarship on the politics of development – as China attempts to navigate its transition to a market economy, while keeping its 'statist' moorings. Dr. Natarajan has demonstrated how and why the problem of food consumption and class and income inequality continue to plague the current Chinese leadership and as he concludes, given "the long-term cyclical pattern of policy changes and radical institutional engineering, the agrarian sector would likely undergo further rounds of major reforms to meet emerging challenges."

With this work, written in easily negotiated language, we hope to make the intricacies and complexities of Chinese agrarian sector more accessible to the scholars and students of China in India, as also more widely understood by the interested layperson.

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Preface

This monograph intends to reflect on the idea of development as a problem of political economy. By examining China's uneven, awkward and often times enigmatic socio-economic transformations since the mid-1960s, I hope to substantiate the following two central claims. First, Chinese economic development strategies from the 1960s to the turn of the century can be understood as being specific, unique and possibly unprecedented. Second, the pace and character of these transformations suggest the need for reconsidering certain conventional approaches in development theory and practice. The monograph titled *Agrarian Change and Rural Transformation: China's Development Experience since 1965*, engages with the conceptual challenges involved in explaining the linked and multiple transitions from the rural to the industrial. The Chinese experience is not only an apt example to explore tensions within the ruralindustrial divide but also, and more significantly, how these two domains are mutually shaped through reciprocity.

China's agrarian history is well-documented, substantially commented upon by credible scholarship and has occupied the minds of several significant development thinkers, which makes it both, a source of analytical strength and a daunting challenge. While, on the one hand, the sheer volume of the relevant literature on the subject of agrarian change prevents us from reaching easy conclusions on patterns or historical trajectories, on the other, simply outlining a grand or big picture can equally be fraught by the possibility of missing out the crucial details. Despite these potential difficulties, the rapidity, scale, variety and depth of the socioeconomic changes that have swept over Chinese agrarian society in recent decades, ensures that any larger debate or enquiry into the nature of development, industrialization, transition and modernization in contemporary times cannot ignore the Chinese context. In other words, it is difficult, if not impossible to carry out a meaningful exercise on the political economy of rural society or agrarian change without drawing upon the specific and unique experiences of China.

The monograph delves into the Chinese example in order to understand the larger discussion on the dilemmas involved in rural transformation. The first chapter titled "Chinese Agriculture: Some Historical Considerations" provides a historical context for the conceptual and empirical discussions in the subsequent chapters. This encompasses a review of the debates on productivity, 'involution', longterm agrarian change and ideas on agricultural and rural development. The following six chapters are divided into two thematic parts with distinct periodization.

Chapters two to four examine the strategies for comprehensive rural transformation, along with the complexities involved in the launching of industrialization initiatives,

during the decades of 1950s through to the late 1970s. The empirical analyses relating to agricultural production and food consumption strongly indicate a positive shift towards meeting *and* improving the livelihood requirements of the rural populace.

Chapter five to seven examine the sudden and dramatic shifts in the momentum of rural transformation since the 1980s. It is suggested that the legacies of the earlier phases of rural transformation and socialist construction are critical to the processes underlying the post-1979 shift to market-oriented and market-determined transitions. Consequently, we have witnessed an intense churning between several elements and processes involving markets, socialist state apparatuses and global influences.

Finally, in conclusion, the monograph suggests that the unique Chinese experience with rural and agrarian transformation change compels a reconsideration of ideas around economic development, transition and social change.

I gratefully acknowledge the patience and generosity of Prof. Utsa Patnaik. Her scholarship, guidance and supervision throughout the course of a long drawn and difficult research pursuit, helped the thesis towards final completion. My family and friends have been most supportive throughout my explorations and writing and words are inadequate to express my appreciation. Finally, I am also thankful to the Institute of Chinese Studies, Delhi, for its support and encouragement in bringing to a wider audience, the core findings of my doctoral thesis in this monograph.

Sriram Natrajan

Contents

1. China's Agriculture–Some Historical Considerations

CHARACTERIZING CHINESE AGRICULTURE

Until the early 1950s, China was predominantly an agrarian society with over 80 percent of the population (over 500 million in 1953) residing in rural areas. This proportion is most likely to have been the long-term average for several centuries. Historical sources, in the form of administrative documents at various levels of the state apparatus going back to over 500 years, in additon to treatises on agriculture dating back to nearly a century and a half, have enabled scholars to compile and examine broad features and tendencies of Chinese agrarian society1. A pioneering work in this regard is Perkins' (1969) that evaluates Chinese agricultural development over 600 years. One of its main findings is that at least until about the mid-20th century, the expansion in food production was such, as to maintain or even exceed living standards. Given the severe limitations to expanding cultivable land, this was achieved almost entirely by constant innovation, development and application of traditional methods/ technology.2 According to some estimates, both population and grain output arose six times between the 14th and the 19th centuries, and by about

1 Shih (1974) is a short survey of a 16th century text on agriculture in China titled–*Ch'i Min Yao Shu*. This text is in the form of an agricultural encyclopaedia compiled by Chia Ssu Hsieh (JiaXuxie), a district governor of that time. The title of the encyclopaedia translates as *Essential Ways for Living of the Common People* and in the author's words, it is a practical guide to improvement of rural life in general. The materials for this encyclopaedia were derived from oral and written sources (therefore earlier treatises or classics that contained references to agriculture and agricultural practices) as well as the author's personal experience (experiments!) in addition to the then current knowledge pertaining to a wide domain of study included as part of agriculture–agronomy, horticulture and animal husbandry besides several branches of natural science including meteorology, pedology, astronomy etc. Myers (1978:297, footnote 1) discussing the development of Chinese dry farming techniques during the Sui dynasty (581-618 AD) and the origins of wheat cultivation, refers to a Japanese survey of this encyclopaedia (Amano Motonosuke, *Chugoku Kono Shoko*, Tokyo, RyukeiShossha, 1975).

2 Traditional methods refers to the set of all those practices and potentialities such as increasing cultivated areas as well areas sown, devising and programming the combination and sequence of crop rotation that prevents soil stress, developing higher quality fertilizers, improving seed selection procedures and practices, collating and distributing dispersed knowledge widely in all the above aspects for testing and making further improvements and above all improving and maintaining water control systems which occupies a central position in rice agriculture. In Perkins' view, beyond the mid twentieth century, traditional agriculture in the face of a physical limit to cultivated land could not have achieved the necessary growth to keep pace with the shift in the demographically induced demand.

50 percent percent in the first half of the 20th century. Expansion of cultivated area accounted only for one half of this increase in output and therefore the other half came about via increased yields.3The rise in yields can only be attributed to improved seeds, changing cropping patterns and new crops besides a continuous expansion and maintenance of water control systems besides development and application of new forms of fertilizers (mostly organic).4

Boserup's (1965, 1981) hypothesis that population growth stimulates innovation and development appears relevant in the context of Chinese agrarian history. Pointing towards a reciprocal interaction between population and land use, she states that earlier the small tribal groups did not acquire permanent settlements/villages and exploited natural resources extensively (shifting cultivation, slash and burn) which allowed the land to remain fallow for long periods. Later, when the population grew and became settled, the periods for which the land remained fallow shortened and methods for artificial restoration of soil fertility was adopted. Ancient settled cultures - China being one of them - practiced intensive cultivation, with multiple cropping and continuous improvements in irrigation over centuries. Therefore, population growth did not lower land productivity or necessarily even lower labour productivity, because crop rotation and cultivation patterns were altered to raise yield while employing the increased labour supply more productively. In countries like India and China, technical change is expected to be labour augmenting, not labour replacing.[5]

It is important to note that in standard western (or Northern) discussions 'land productivity' is usually defined in a manner that obliterates the crucial distinction between European feudal and more ancient Asian agrarian cultures. Owing to their temperate climate with the ground frozen or under snow in winter, most of Europe and North America historically, and even today, can grow only one crop a year–thus 'crop rotation' refers to a given plot of land growing different crops in successive years. But, in India or in China (except the Northern parts), when we talk of crop rotation, it means a given plot of land growing different crops in successive seasons over the same year. The US farmer in Idaho may grow wheat, giving 7 tonnes a hectare, but that is all he can grow in a year, while the farmer in the Kaveri delta (southern India) over the same year will grow two successive crops of rice and a crop of gram. The Punjab (Northern India) farmer will grow wheat and rice and cotton.

What is 'output per hectare'? Comparison of 'output per hectare 'has no meaning unless output is defined over the same production period, which brings in the

3 See Perkins (1969:37).

4 For an elaborate discussion, see ibid. chapters 3 and 4.

5 Boserup (1965) *The Conditions of Agricultural Growth*

specificity of multiple cropping. It will be higher for US if we take the *gross* sown area, but higher for the Indian farmer if we take *net* sown area. If over a time period, a given plot of land can grow 2 to 3 crops, it would clearly be more 'productive' than a plot of land the same size which can grow only one crop. Clearly, the population with the more climatically favourable land will enjoy a more diversified output vector and will produce more in physical terms from a given area of land with the potential for a higher standard of living. Similarly 'labour productivity' may be much higher in industrialized agriculture, but since living labour has been replaced by dead labour (machines), the energy intensity of agriculture becomes very high and the energy balance deteriorates (ratio of energy derivable from a given output of crop to the ratio of energy going in as inputs). Moreover, such a system would still import heavily owing to the limited range of output that can be produced.

If we add up the physical tonnage of all food crops from FAO-FBS data, then in 2007, USA had 664 billion tonnes of output and India had 850 billion tonnes of output even though USA's cultivated area is much larger than that of India. China had 1292 billion tonnes of output although its cultivated area is smaller than India's. Undoubtedly, output per head of population is highest in the US, but import dependence is substantial as well, and further owing to high levels of manufactured inputs and mechanisation, the energy balance in USA is poorer than in China and India. The 'higher productivity' of tropical lands was legendary among Europeans not only because of multiple cropping but also because tropical lands could produce a range of crops Europe could not.

Perkins draws attention to a crucial factor (a parametric shift) that necessitated an increased priority to agriculture, in particular, grain production during the early decades of the People's Republic. This was the doubling of annual average growth rate of population from 1 percent during six centuries until around the mid-20th century, to 2 percent by the 1950s and the 1960s. In the early 1960s, adoption of modern technology in agriculture became inevitable once the potential for increasing output by traditional means were exhausted or were declining.

A less favourable view of Chinese agrarian history can be found in Huang (1990) in which agricultural systems are classified into three categories defined by the capacity to break through the barrier of declining productivity due to an expanding population over long periods of time. Agricultural systems are therefore, either (a) "developmental" where productivity and income increases in per capita terms are achieved; (b) "intensive", when productivity levels are maintained or (c) "involutionary" in which average productivity and income increases are close to zero or falling. For over 600 years until the early 1980s, Chinese agriculture according

to this view belonged to the last category - namely involutionary. Accordingly, in the period following the founding of the People's Republic of China, agriculture continued to proceed along an 'involutionary' path albeit institutionally distinct "Collectivist involution". In other words, despite a paradigmatic change in organization of Chinese economy and society, the system did not transit to a 'developmental' state and the evidence to support this takes the form of a stagnation of (or even decline in) labour productivity and income per day during 1950-1980[6]. A fundamental cause for this is attributed to a large pool of underutilized labour force in the rural economy - "surplus labour" that had limited or no access to alternative productive employment. This characteristic factor diminished returns per workday and thus consumption levels persisted "close to the margins of bare subsistence".[7] In this view therefore, collective agriculture achieved neither productive nor allocative efficiency and merely perpetuated the six centuries old peasant economy. Further, even though increases in yields were continually achieved, these were skimmed away by the Chinese state. Tang (1982: 326) echoing a similar view as regards the last point in a discussion of comparative land redistribution in China and Taiwan notes–"...land redistribution on the mainland was soon followed by collectivization, where the collective farm was more an arm of the state siphoning off rent, than a cooperative capturing scale economies for its members".

In contrast, Madison (1998), a leading quantitative macroeconomic historian, argued that Chinese agriculture, in the longer term, was well-nurtured by its "bureaucratic models of governance". Given that agricultural surpluses were crucial for bureaucratic and imperial income, agriculture was positively influenced and shaped, according to him, by state projects involving hydraulic works, the active settlement of farming communities in new regions, the development of public granaries system and the fostering of innovation in seed varieties and crop combinations. Madison, in fact, concluded that for hundreds of years before the 'disorder' of the 19th century, Chinese agriculture operated in an institutional order that was "efficient in its allocation of resources and was able to respond to population pressure by raising land productivity". This, despite the largely strong rent seeking disposition of the imperial bureaucracy and gentry.

Empirical evidence however, on various aspects of the rural economy in general and indicators of production conditions in agriculture and related sectors for the periods 1949-58 and 1965-79, clearly display an agrarian transition or a fundamental shift (transformation) that is vastly different from the evolution in pervious epochs

6 Huang (1990: 12-13). Conceptually, agricultural involution was originally developed in Geertz (1963) from a study of colonial Indonesian agriculture.

7 Huang (1990: 16)

of China's agro-economic history. High priority to capital construction in agriculture between 1965 and 1980 while expanding production possibilities, also fundamentally enhanced the capacity to moderate and compress the cyclical weather-induced fluctuations that were (negatively) integral to Chinese agriculture for centuries, besides gradually increasing average levels of consumption. The expansion in consumption, within a framework of collective framework of production, accrued to its members both as an economic and a social entitlement. This was possible by the creation and therefore expansion of employment both in direct agricultural production and indirectly in the formation of agricultural capital besides rural industrialisation.

The view that China's collectivised agriculture was a mere continuation of a six centuries old 'involutionary' path by means of a single parameter, namely declining productivity per unit of labour or its variant income per workday, fails to account for those myriad dimensions of transformation that rural China underwent for over three decades until the early 1980s. The period from the early 1950s to the mid-1960s encompassed a series of attempts to develop various forms of collective institutional arrangements in both agriculture and industry. This included the period 1958-60, when a combination of factors such as a nascent administrative structure, extreme climatic disturbances, severe paucity of resources, underdeveloped transport and communications infrastructure, intense intra-party political struggle, besides other input constraints, dealt severe setbacks to Chinese agriculture.

AGRARIAN CHANGE: 'INVOLUTION' OR TRANSFORMATION?

The central question relevant to and emerging from the study of Chinese agriculture over a period of five decades since 1950 is whether it underwent a transformation or was characterised by the persistence of a predominantly peasant economy–along with modern industrial development. In other words, corresponding to the agrarian transition that present day industrial societies underwent prior to and during the process of industrialisation, did Chinese agriculture display a distinct mode of transition during the collective era and if that be the case, what constituted such a transformation? Huang (1990) has argued that commercialisation and diversification of rural production during various phases of economic expansion and contraction for close to 600 years until the establishment of the People's did not generate a transformative process. Here, Chinese agriculture is depicted as "involutionary" for much of this long term period. The conclusion that China's agriculture retained the same historical pre-1949 characteristics well into the era of collective agriculture is examined critically below.[8]

8 In Huang (1990), the geographical area of study is relatively an ecologically stable and highly productive

The "involution" thesis attempts to frame Chinese agrarian development within two models of peasant agriculture–one outlined in Chayanov (1966) and the other developed in Schultz (1964)–both of which are compared to a so called standardised capitalist model. In the Chayanovian mould, peasant households stood in contrast to a 'capitalist' farm in two basic respects; labour is provided from within the household and production is predominantly directed towards self-consumption.[9] Therefore, profit-maximisation or remunerative wages for labour (imputed) are inappropriate variables to evaluate efficiency or optimality. The optimality of such a system "takes the form of equilibrium at the margins between the satisfaction of consumption needs and the drudgery of labour, not between profits and costs". The dynamics of such a system takes the form of a "demographic differentiation" (labour/consumer ratio) rather than a social differentiation.[10]

In the alternative model, represented by the work of Theodore Schultz (1964), peasant economies were viewed as operating just as efficiently as competitive markets in terms of allocation of resources–labour, land improving investment and other inputs. In this formulation, where peasant households behave in a "rational" manner, the factor limiting any dynamic transformation is that of diminishing marginal returns to traditional investments.

There are some problems with the theoretical basis of the 'involution' theory two of which are elaborated below. First, peasant, economy, agriculture and the theoretical framework in terms of a combination of a Chayanov-Schultz formulation are clearly not appropriate to examine collective agriculture between 1950 and 1980. As regards the early part of the 20th century, it can be argued that even though peasant households predominated in Chinese agriculture, control over large holdings by warlords and other feudal land-owing classes was significant in terms of proportion of cultivable land. In 1934, the top 10 per cent of farming households owned 53 per cent of the total cultivated area while the bottom 68 per cent owned 22 per cent. The middle peasant comprised the remaining 22 per cent of total farming households owning a quarter of

region of China around the Yangzi delta. As he notes about this region "... a mere 20 major floods in the 500 years between 1401 and 1900, an opposed to annual flooding in the North China Plain." But the conclusions drawn about 600 years of involutionary agriculture in China since the late 14th century also includes the North China plain which is the focus of study in Huang (1985). The Yangzi delta was a highly commercialized and urbanized economy since the 18th century with cotton cloth, mulberries and silk being the mainstay and therefore a highly developed agriculture and industry flourished since that time. (p. 48)

9 This does not mean that production is never in excess of consumption but that it is marginal when it arises and even when the sum total of surplus production by innumerable peasant households enters the market–commercialization—it does not by itself generate sufficient conditions to bring about a transformative process.

10 See Huang (1990: 8-10).

the total farming area. The direct benefits that accrued from the socialisation of land and income and wealth redistribution translated into a high proportion of savings and investment as well as higher levels of consumption during the early 1950s. This issue has been comprehensively examined in Lippit (1974). Lippit's study estimated that land reforms redistributed 13 per cent of net domestic product in 1952. Peasants' disposable income rose by a quarter after taxes and compulsory procurement at low prices. Similar estimates were provided by Perkins (1975: 176). Riskin (1987) also discusses at length these aspects of the earlier phase of collectivisation. Patnaik (1998) discusses the conceptual issues surrounding actual economic surplus mobilized for investment and the potential economic surplus from mobilization of underemployed labour in China with estimates for the period 1950-58.

Besides the traditional role of agriculture providing investible resources for industrialisation, the collective institutional structure effectively mobilised seasonally surplus labour to build agricultural capital in the form of water control and distribution, infrastructure, land augmentation and reclamation as also increments in the quality and quantity of agricultural inputs. For the period 1950-79, the issue of commercialisation becomes irrelevant, since production (as well as consumption) was neither determined by markets nor prices and agricultural production was gradually aligned with and conditioned by the objective of a sustained supply of wage goods.

In the 'Collectivist involution' formulation, Chinese agriculture during 1950-80 is modelled as a production system where return per person is stagnating or declining and even though increase in yields are continually achieved, the returns/income per person stagnates or declines due to two reasons: first the labour to land ratio is very high implying an increasingly large pool of underemployed labour and second the state continually skims away the gains that are achieved in production. Further, without alternative employment for the "surplus labour" in agriculture or other sectors, there emerge diminished returns per workday as well as consumption levels persisting "close to the margins of bare subsistence".[11] As Huang (1990) notes "…at a given level of technology, population pressure will sooner or later lead to diminished marginal returns for further labour intensification." He further adds, "…[T]he degree to which a peasant economy will involute depends very much on the relative balance between its population and available resources. Intense population pressure relative to resources, can lead to increasing quantities of surplus labour and therefore intense subsistence pressures the conditions under which 'intense involution' takes

11 The implicit argument in Huang (1990:16) is that capitalist enterprise (in place of collective organization) would have eliminated surplus labour from production and therefore by increasing output per unit of labour turned Chinese agriculture from an involutionary system to a developmental one.

place. In contrast to intensification and involution, development generally occurs with not just increased population pressure, but an efficient division of labour, increased capital inputs per unit of labour, or technological advance".[12]This is thus a formulation ultimately determined by demographic expansion, where population is in excess of what would otherwise be optimal to a given set of resources. The primary problem here would therefore be to explore the reasons for the emergence of such a demographic characteristic. Unlike the history of European industrialisation, which is the dominant/standard historical model, the vent for surplus or excess population provided by colonisation of the American continents is almost always not part of the discourse of the Industrial Revolution and the emergence of capitalist forms of production.[13]

In Huang (1990), for the period 1950-80, the analysis goes back and forth between two indicators of involution: (i) a stagnation of labour productivity (and when this does not support the hypothesis for a particular period such as 1952-57) (ii) a stagnation or decline in individual income.[14] This is taken up for discussion in the nextchapter where it is argued that except the disastrous years at the end of the 1950s, conditions in China's agriculture were vastly improved compared to previous epochs of agro-economic history. During this period, besides creation of large scale agricultural capital that not merely expanded production possibilities ensuring a capacity to overcome serious periodic climatic disturbances, a significant and sustained expansion in consumption was also achieved. This expansion in consumption, in order that it may be a justified one, both as an economic and social entitlement, was achieved by the creation and expansion of employment both in direct agricultural production and indirectly in the creation of agricultural capital.

In his evaluation of Chinese agriculture until the late 1970s as "involutionary", Huang (1990) discusses important aspects of collectivist transition that do not conform but instead, in effect contradict the hypothesis as they indicate if not a break with involution, at least a reversal of involutionary tendencies.

For example, from empirical data for Songjiang county for the period 1952-55 and 1976-79, it is argued that improvements in water control, introduction of high yielding varieties of rice along with increasing application of fertilizers and pesticides led to a rise in average rice yields by over 30 per cent from 532 catties to 716 catties

12 See ibid. p 11.

13 This history of capitalism is sans a history of land and it is sufficient here to mention this rather than embark on a serious examination given the limited scope of the present work.

14 "There was an expansion in the absolute values of output and, to some extent, even in annual incomes per household, but this was due to more days worked by household members, especially the women, children and elderly, not greater net returns per day" Huang (1990: 306).

per mu. While this increase was due to improved cultivation techniques, the switch to double cropping with the aid of partial mechanisation since the mid-1960s contributed to a higher overall increase in yield per cultivated area at 1222 catties per mu. "Improved yields accounted for about a quarter of this increase (182 catties) and increased cropping frequency the rest"[15].

On the mobilisation of labour, both during winter for water control projects and at other slack seasons for field improvement, Huang notes: "It is hard to imagine how these improvements could have been made at so little cost and so systematically in a laissez-faire family farm economy" (1990: 234).

Moreover, collective industry in rural China "is in fact the dominant mode of rural industrial organisation in the Yangzi delta, and indeed in most of China. It is the form of productive organisation that powered most of the rural industrialisation that took place in the 1970s and the 1980s, and it is what distinguishes the China experience from that of most other Third World countries" (Huang, 1990: 265).

"There was an expansion in the absolute values of output and, to some extent, even in annual incomes per household, but this was due to more days worked by household members, especially the women, children and elderly, not greater net returns per day".[16] That the number of remunerated workdays increased significantly for a vast number of households during the period until the late 1970s, is in itself a major advance over the pre-1949 conditions is not recognised here.

A characterisation similar to the "involution" theory is found in Elvin (1973) where the term "high level equilibrium trap" is used to describe the condition of China's agriculture around the mid-20th century. Here it is argued that both in technological and investment terms, agricultural productivity per acre had nearly reached the limits of what was possible, without large scale industrial-scientific inputs, and the increase of the population had therefore steadily reduced the surplus product above what was needed for subsistence. With falling surplus in agriculture, and also falling per capita income and per capita demand, with cheapening labour but increasingly expensive resources and capital, with farming and transport technologies so good that no simple improvements could be made, the rational strategy for peasant and merchant alike tended in the direction not so much of labour saving machinery as of economizing on resources and fixed capital.[17]

15 Ibid. pp. 225-227.

16 Ibid. p. 306.

17 Elvin (1973: 312). The argument is extended as follows; "It was the historic contribution of the modern West to ease and then to break the high level equilibrium trap in China." (pp. 314-5).

AGRARIAN CHANGE IN RICE ECONOMIES–TECHNICAL AND TECHNOLOGICAL PARAMETERS

The issue of agrarian change in China has also been discussed within a wider historical question known as the 'Needham question' or 'Needham puzzle'. This question which has puzzled some European China scholars emerged out of Needham's mounmental study of the history of science and technology in China, that found European achievements by 1500 A.D. to be comparatively far behind those of China (Needham (2004), Vol. 7 Part II). Yet China did not undergo a scientific revolution and/or move into a trajectory of capitalist development. Bray (1986) argues that part of the reason why the 'puzzle' remains unresolved is the formulation of the question itself. The identification of the course of the Industrial Revolution with the evolution of the capitalist form of socio-economic organisation in Europe, has perhaps been over generalised. According to this view therefore, the nature of the agrarian system and its historical development–in particular rice cultivation - that began to dominate China's agriculture since 800 A.D., may partly provide an answer. Some of the main arguments in Bray (1986) are discussed below.

Bray's study emphasises the technical conditions and organisation of production (in terms of the scale of operations, managerial control etc.) that are compatible with land-scarce intensive rice cultivation and in this view the latter fundamentally determines the form of organisation of production. As Bray (1986: 2) notes " …in a society where relatively scarce and expensive wage labour is the basis of production, technical progress is largely evaluated in terms efficiency in replacing labour. Yet this highly specific model of technological advance is generally presumed to be universal in its application. Although one can easily envisage situations in which different criteria might apply, little attempt has been made to hypothesize alternative paths of technological development or to examine the social and economic implications of such differences". Further, unlike wheat, rice cannot be organised on large scale managerial production because of the peculiarities of the processes involved in rice cultivation (for example multiple cropping with varying diversity in the annual cycles). The intense nature of labour application in rice cultivation renders managerial effort uneconomic and therefore limits the size and scale of operation.[18] Centrally managed large farm estates, heavily dependent on the use of animal or mechanical power (which were more common in North China), provide scope for economies of scale that is characteristic of wheat or millet cultivation and differ significantly from rice cultivation.

18 See Bray (1986) for an elaborate examination of technical conditions of rice production that has played a central role in the evolution of tenurial and therefore organizational dynamics.

Bray (1986) extends the contrast between European grain farming and Asian rice cultivation by comparing the technical production conditions that historically influenced the nature and course of technological change or progress. The terms 'mechanical technology' and 'skill-oriented' technology in European and Chinese agriculture respectively, are used to describe the contrast. While the former is about labour substitution, the latter involves development and intensive use of human skills, both practical and managerial. This is not to deny the absence of one or the other in both types of agriculture but merely to emphasise the conditions that are imposed by the nature of the distinct grains that both societies cultivate. [19]

Thus, "a significant difference between the technical development of Western grain farming and Asian rice cultivation, which has important implications for explaining socio-economic change, is that while wet rice agriculture has enormous potential for increasing land productivity, most improvements are either scale neutral, and relatively cheap, or else they involve increasing, not capital inputs but inputs of manual labour. … The inconspicuous, low-cost nature of many improvements in wet rice cultivation, and the association of highly productive techniques with a form of tenurial relations, namely small holdings, regarded by many as backward, have contributed to the image of Asian economies as historically stagnating and resistant to change. Yet, there is abundance of evidence to show that great progress has been made over the centuries in increasing the productivity of rice land. Furthermore, the development of rice agriculture has often been accompanied by the growth of commercial cropping, trade and manufacture, as well as significant changes in the relations of production".[20]

However, Bray (1986: 7) cautions against overemphasising technical conditions that determine technological development to solely explain social development. "A model based on technical dynamics alone cannot account for the political, institutional and external factors which have played such a crucial role in shaping the Asian nations. Yet, despite their many cultural and political differences... societies that depend for their main subsistence on wet rice cultivation have in common a basic dynamic of technical evolution which differs from the model of progress derived from the western experience, and which imposes very different constraints upon social and economic development".[21]

19 See ibid. Chapter 4 for a detailed discussion on this contrast.

20 Bray (1986: 5).

21 Ibid, p. 114–Discussing the problem of terminologies such as 'technical' and 'technological', Bray refers to disembodied (for example, organizational improvements) and embodied technical change used by economists–the difference between the two being the absence or presence respectively of new investment in plant and equipment.

Further, "the specific technical and organisational requirements of rice cultivation have a pervading influence on the rural economy as a whole, which is manifested at a number of levels. The relatively inflexible ratio of irrigated to non-irrigated land would influence crop choices, for example, while the demands of operating an irrigation system will determine the timing of all agricultural operations, as well as the organisation of labour within the community as a whole. The intensive but intermittent labour requirements of rice cultivation have the effect of tying large numbers of skilled workers to the land, at the same time leaving considerable scope for investing surplus household labour in commercial cropping or petty commodity production".[22]In economics literature, technological change in agriculture has generally been simplified as either substituting labour or land based on historical experience.[23]In both the 'new world' such as Australia and the North American continent (that presented plentiful land but scarce labour), and in the case Europe during the early stages of industrial revolution, when labour remained in high demand but was scarce and expensive, labour substitution became the norm. However, in 19th and early 20th century Japan, though land was in short supply it did not displace labour. In fact, effectiveness of additional labour application was sought to be increased by eliminating bottlenecks during peak labour demand or by performing tasks more thoroughly. Thus, horses were increasingly used for hoeing, supplemented by hand tillers and transplanting machinery. There is also the possibility of technological change that increases both land productivity and labour demand. Bray (1986: 125) argues, following Geertz (1963), that intensification of rice production has the potential to not only absorb additional labour but also, with improvements in the technical conditions (for example, mechanisation of the most labour-demanding processes such as transplanting or harvesting) to spread the labour requirements more evenly over the production cycle.[24] Bray distinguishes between two types of technologies in rice agriculture–both not opposed to each other but adaptable in different degrees based on other conditions.

1. Biochemical technology such as improved varieties, fertilizers and
2. Pesticides which can be considered land substitutes as they increase yield; and
3. Mechanical technology that substitutes labour.

22 Ibid, p. 112. For an elaborate discussion of the technical contrasts as well as the historical development of Western (European), Chinese and Japanese agriculture see Appendices A, B and C respectively in ibid.

23 See Hayami and Ruttan (1979) for a formal treatment of these two types of technological change.

24 Bray (1986: 3-4) treats the 'new world' and the European cases as separate owing to different conditions, though both required labour-saving technological change: in the former owing to land abundance relative to labour while in the latter owing to labour scarcity. The type of technological change discussed here frequently depends upon highly skilled labour and does not necessarily require mechanical sophistication: indeed it is not unusual for agricultural implements to become simpler as cultivation techniques become more sophisticated and productivity rises. See also Boserup (1965).

It must however be added that some inputs can save both land and labour–such as herbicides or mechanical pump sets.

Japanese scholars have also regarded the technical specificity of rice cultivation to be a fundamental concept.[25]The Japanese model of agricultural (rice) development proposed by Ishikawa (1967) and Ogura (1967) consists of three principal features derived from Japan's historical experience:

1. Intensification of land use and relying on such inputs as fertilizers, improved varieties and better techniques[26];
2. The modest level of capital required; and
3. Small scale and easily divisible nature of the improvements, appropriate to the prevailing levels of technical development and patterns of agricultural organisation.

The replicability of the Japanese experience in agricultural development in the latter half of the 19th century, when remarkable increase in productive capacity was claimed to have occurred along with rapid industrialisation, in other rice growing societies, is a more difficult and complex issue.[27] The technical specificity of rice cultivation (as outlined above) highlights the possibilities for a certain pace and direction of agrarian change but the configuration of other parameters outside of the agrarian system (the social, political and historical) would emerge as more important.

The conventional view of rapid rise of productivity in Japanese agriculture was strongly challenged by James Nakamura who re-estimated agricultural growth in Japan during 1871 to 1922 and obtained a growth rate of rice production of less than 1 per cent per annum, below the population growth rate.[28] Nakamura's argument was that the actual levels of late Tokugawa and early Meiji agricultural yield and output, were substantially higher than shown by the official figures which had been uncritically used to obtain spurious high growth. Both under reporting of yields and

25 See ibid. pp. 154-55 for a detailed discussion in this regard. Also "[T]he distinctive feature of rice cultivation is the degree of intensity with which land can be used. If quick ripening varieties are used, as many as three crops of rice a year can be grown even by farmers who do not have access to chemical fertilizers. This means that once rice cultivation is established in a region it will sustain population growth almost indefinitely." (Ibid. p.26).

26 Ishikawa (1981) uses the term "labour using technological factors" in rice cultivation to describe the potential of increasing yields by adopting a new technology that also requires increased inputs including labour.

27 Dore (1960: 95) discusses agricultural development in Japan during 1870-1900 and notes that while agriculture provided surplus to finance industry, it was not starved of capital.

28 See James I Nakamura (1966) *Agricultural Production and Economic Development of Japan, 18731922*, Princeton University Press.

under measurement of the area cultivated, had been resorted to by the producers to reduce taxation. As the Meiji state carried out five modern cadastral surveys between 1873 and 1900, the underestimation problem was progressively resolved so the later figures of output are more accurate. Scholars like K. Ohkawa have been obliged to revise their estimates of agricultural growth downwards in the light of the critique (See Ohkawa and Shiniohara, 1979). Nakamura's contention, that the output of the basic staple rice, fell behind the population growth rate, is confirmed by other research (Penrose 1940, Grabowski 1985) and has been consistent with the active measures the Meiji state took to develop Korea and Taiwan, its colonies as rice exporters especially following the 1918 Rice Riots in Japan.[29]

MODES OF TRANSITION

While agrarian change in Japan as part of the wider transformation of the economy and society (in other words, industrialisation) has been distinct owing partly to the technical specificity of rice cultivation, there is some resemblance to the European experience regarding the source of funds for industrialisation. Besides agricultural surplus, colonial extraction played a significant part in financing industrialisation.

However, in the European case, the term 'agrarian transition' has been used to denote the resolution of the agrarian question that was a central episode of all advanced capitalist countries.[30] This resolution, it has been argued, concerns two conditions that the agricultural sector must meet; first, to provide surplus in amounts that is necessary for industrial development and second to contribute to the creation of a home market for industrial output. These twin primary conditions are essential for the 'full' development of capitalist forces.[31]On this point, Byres (1982) notes that the agrarian question has to be resolved before capitalism can be said to truly dominate social formation.

29 See Penrose, E.F. (1940) 'Rice culture in the Japanese economy' in E.B.Schumpetered. *The Industrialization of Japan and Manchuko,* New York Macmillan, and R. Grabowski (1985) 'A Historical Reassessment of early Japanese Development' in *Development and Change*, Vol. 16, April 1985, pp. 235-250. See also Ohkawa, K. and M Shinohara, (1979) *Patterns of Japanese Development: A Quantitative Appraisal*, Yale.

30 Agrarian transition as a theoretical construct is exclusively part of the Marxian discourse on the evolution of capitalism. There is no alternative formulation that seeks to explain the historicity of the agrarian question.

31 There is an enormous amount of literature on this issue that originates from the ideas of Lenin. The references consulted in this regard are David Goodman and Michael Radclift (eds) (1981) *From Peasant to Proletariat: Capitalist Development and Agrarian Transition*, St. Martins Press, New York and T.J.Byres, "Agrarian transition and the agrarian question", in Harris (ed) (1982) *Rural Development*, London, Hutchinson University Press.

"The development of capitalist agriculture and its eventual yielding of hegemony to the urban bourgeoisie was a long-drawn-out process, sometimes stretching over centuries, which has taken a variety of historical forms. What emerges clearly from any attempt to understand the differing historical circumstances in which the agrarian question has been solved in the past is that the framework in which the analysis is contained must be a broad one. The historical roots must be traced with care; the whole social formation must be kept in mind; developments within agriculture, between agriculture and other sectors, and indeed, within other sectors must be considered and seen in their mutually determining relationships; the emergence of new classes, shifting class relationships, and the changing hegemony of classes must be examined; the nature of the state must be at the forefront of one's analysis; and the emerging contradictions must be identified".[32]

In socialist countries however, Byres (1982: 83-84) argues that the agrarian question is unresolved until the emergence or domination of the socialist state and the classic solution to the agrarian question in socialist contexts has been collectivized. Saith (1985) examines theoretical questions with regard to the necessary conditions both historical and contemporary–for socialist industrialisation and the position of the agricultural sector (the peasantry) in developing countries by comparing their experience with that of Russia (the former Soviet Union).

"In the context of socialist transition in a poor developing country, the agrarian question bifurcates into two dichotomous sets of issues. The first concerns the instrumentality of the agricultural sector in assisting industrialisation through the provision of investible resources which the nascent industrial sector cannot generate in sufficient magnitude from within, or from other sources (for example, colonies). The second set treats the rural sector not as a continued object of exploitation in the form of primitive socialist accumulation but rather as the subject of socialist development by virtue of the fact that it is in the rural sector that the bulk of the population especially it's poor and oppressed component, resides."[33]

AGRARIAN CHANGE IN CHINA–THE EARLY PHASE (1950-65)

At the time of the founding of the People's Republic in 1949, China inherited a predominantly agrarian society, with over 80 per cent of the labour force engaged in agriculture. Though the enormous geographical area discernible from topographic representations to some extent, dispel familiar notions of the country as overcrowded

32 Byres (1982: 83).

33 Saith (1982: 23). It must be noted here that colonial economic history of Europe does not at all figure in this theoretical framework.

and packed with humanity, in actual reality, over 70 per cent of the Chinese live within 30 per cent per cent of its total area, concentrated in the coastal eastern and central regions. Moreover, just about 10 per cent per cent of the total area is cultivable.

In 1934, the top 10 per cent of farming households owned 53 per cent of the total cultivated area while the bottom 68 per cent owned 22 per cent. The middle peasant comprised the remaining 22 per cent of total farming households owning a quarter of the total farming area (Wu, 1944: 128). Rice yields per acre in China were slightly lower than Japan but more than twice that in India. In the case of wheat, yields were higher than that in the USA and the then USSR (Chen and Galenson, 1969).[34] In 1949, out of the 425 million (about 85 per cent of the total population) who survived on land for sustenance, 30 per cent were tenants paying rents averaging 50 per cent of output. Further, China emerged from a civil war that had destroyed the rubric of society, left it war-torn, inflation-ridden and fragmented. A relatively small modern industrial sector that developed during the Japanese occupation in Manchuria was the only endowment from which China was to launch her modernisation.[35]The rural society's highly feudal character and the consequent unequal distribution of income and wealth severely restricted possibilities of investment, innovation and growth in China's agriculture.

The land reform carried out in China after the formation of the People's Republic in 1949 is recognized as one of the most radical redistributive land reforms in history and affecting, as it did, nearly a quarter of humankind, it drew intense attention from scholars.

"The abolition of rent, interest and most profit was complete by 1953, as under the agrarian reform, landlords, moneylenders and traders ceased to exist at all, and most rich peasants ceased to cultivate with hired labour as their control over land was reduced. Of the total cultivated area of 107.9 million ha. It is estimated that about 44 per cent was redistributed through seizure without compensation and allotment by village committees without taking any payment, to the landless and the land-poor peasants. This is an extremely comprehensive and thorough going order of redistribution which despite some errors of classification and some abuses, meant the effective 'levelling' of the rural population and the securing of a highly

34 Rice yields in China, Japan and India were respectively 67, 68 and 29 kilograms per acre while that for wheat in USA, USSR and China were 14, 10 and 16 kilograms respectively.

35 It has been argued that the economic heritage that the Chinese inherited in 1949 was not entirely dismal. Putterman (1993, p. 13) notes that a fairly modern albeit small industrial sector in Manchuria was one positive feature in 1949. But "decades of war and civil war had destroyed much of that industrial capacity and much of what was left was removed to Hong Kong and Taiwan ahead of the advancing People's Liberation Army" (Riskin 1987, p. 33).

egalitarian distribution of resources. Along with land, other durable assets both productive and consumable, were also redistributed" (Patnaik 1998: 231). Hinton (1966) has elaborately disscussed on this issue. However the productive assets per household after redistribution remained meagre. Hinton (1966) gives the instance of four households in Long Bow village sharing one donkey. Individual peasants still lacked the capacity to undertake investment especially in irrigation which was vital for raising land productivity and raising their own incomes. Pooling of their meagre land and resources was the logical next step but likely to be resisted by peasants strongly attached to their property. Even though resources were pooled, the primary level cooperatives therefore retained property rights in land and equipment by paying out of common income for members' contribution of these assets. Once the benefits of pooling were realised by the peasants they went on to form advanced cooperatives where the return to land and equipment was done away with and only the principle of return to labour contributed, determined how the common income was distributed among households. This was a big step towards socialised production. An official Indian delegation sent to China to study agrarian cooperatives, in its 1955 Report, commented favourably on how the advanced level cooperatives were able to complete irrigation works on a scale much larger than would have been possible with individual private investment. This was the rationale for undertaking socialised production on an even grander scale.

Agrarian transition in Socialist China thus began with cooperative production in various phases beginning with the formation of mutual aid teams that consisted of a few households (ranging from 3 to 20) sharing the heavier tasks during peak farming cycles as well as tools, draught animals in both agricultural and sideline production. These were organised around traditional rural practice of reciprocal aid.[36]In 1950, around 10.7 per cent of rural households had been organised in mutual aid teams and by 1954 this rose to 58.3 per cent. There was a simultaneous transition of the MATs, first into lower level agricultural producer cooperatives beginning in 1952. By the end of 1955, around 63.3 per cent of rural households were members of these cooperatives and additionally, 4 per cent had already transited to higher level cooperatives. In 1957, higher level cooperatives numbered about 740,000 and accounted for over 93 per cent of rural households and by 1958, 99.1per cent.[37] Thus, the decision to proceed towards formation of larger scale rural peoples' communes, originally envisaged for 1968, was taken a decade earlier.

36 These traditional practices were refined in the communist held areas prior to 1949. See Riskin (1987: 67-68). See Selden (1982) and Walker (1966) for elaborate discussions.

37 The data is from Eckstein (1977: 71), Table 3.2.

Socialist transformation through collectivisation was one of two transformations envisaged to solve the 'agricultural problem'. The technical transformation of agriculture was to be achieved by the intensification of investment and upgrading of traditional farming practices. This along with limited but selective investment would have enabled agriculture to fulfil not only its basic role of providing for the food requirements of a growing population but also provide raw materials for industry as well as generate some surplus via external trade to enable import of industrial equipment. It must be noted here that 1968 was the original target year by which collectivisation was to have culminated in the establishment of communes.[38]In industry, the socialist transformation was completed by 1956 with the transfer of private industry that controlled over 63 per cent of gross value of industrial output in 1949.[39]The handicrafts sector too underwent rapid co-operativisation during this period, beginning with supply and marketing groups, following a path similar to that in agriculture in various phases. By 1956, of the total 6.5 million rural and urban handicraft practitioners, around 92 per cent were members of Producers' Cooperatives, with the rest belonging to the category of individual handicraft 'persons'. Commerce (retail trading) followed a similar route declining from 85 per cent of retail sales value in the private sector in 1949, to 2.7 per cent by 1957.[40]

Establishing a collective institutional structure however, was not by itself capable of transforming agriculture. The complex aspects of devising and managing practical mechanisms to operationalize an entirely new organisational framework created new challenges. Thus the change over from Agricultural Producers Cooperatives to Communes that was implemented from 1958, involved centralised deployment of labour and accounting. There are two quite different views on the 'Great Leap Forward' strategy. The first view, which is the dominant one in the literature, argues that in the attempt to stretch beyond its collective potential, the Great Leap Forward strategy led to a disorganisation of labour deployment and breakdown of production and distribution systems. This coupled with failed harvests following bad weather during 1959-61, resulted in famine and large-scale deaths. The second view is more cautious, and concludes that the transition to communes and bad harvests occurred more or less together in time, and to attribute causality, blaming the dip in agricultural performance to commune formation, may be misleading. While China saw a 30 per cent drop in grain output by 1960 compared to 1958 owing to droughts,

38 According to the official policy document. See Erisman (1975).

39 In 1956, the categories of socialist industry and State capitalist industry respectively accounted for 67.5 per cent and 32.5 per cent respectively. See Riskin (1987: 96) Table 5.2, for the gradual transfer of ownership between 1949 and 1956.

40 For a detailed discussion see Riskin (1987: 98-100).

floods and pest attacks, India saw a 25 per cent drop in grain output during its severe 1964-65 drought and famine that had occurred in Bihar, but in a context of no institutional change at all. The transition to communes in China took place in 1958 in an exceptionally good harvest year with no inkling of drought in future. It could be more plausibly argued that the timing of the transition to such large scale units, in retrospect turns out to have been unfortunate, and no doubt worsened the social impact of an output decline, which would have taken place in any case. Further, the estimate of massive 'famine deaths' which was built up over 20 years later by two demographers A.J. Cole (1982) and J. Banister (1987), has been contested and critiqued in detail, since these estimates use 1982 Census fertility figures projected backwards to the distant period 1953-1964.[41]

With regard to agricultural development in the initial phase of cooperative production, one of the earliest policy documents that laid a foundational strategy was the National Programme for Agricultural Development (NPAD), 1956-67. NPAD was originally drafted in 1955 during the "high tide of rural socialism", but adopted only in April 1960. This document listed several ambitious targets with regard to regional yields in mechanisation, livestock fisheries and forestry development, water conservancy, better seeds and farming practices, land reclamation etc. and the measures to achieve them.[42]

Besides the specific targets, NPAD comprised a comprehensive 40-point programme for the technical transformation of agriculture and contained the following four thrust areas:

a. Raise yields in the three main agricultural regions between 1956 and 1967; North of Yellow river[43]from 1.12 tons to 3.0 tons per hectare, between the Yellow and Huai rivers from 1.56 tons to 3.75 tons per hectare and for the region south of the Huai River, from 3 tons to 6 tons per hectare;

41 See Patnaik (2002) 'On Famine and Measuring Famine Deaths' in S.Patel, J.Bagchi and Krishna Raj eds., *Thinking Social Science in India–Essays in Honour of Alice Thorner,* New Delhi: Sage 2002).

42 The official English version was published by the Beijing Foreign Languages Press in 1960. It was not approved by the 8th National People's Congress of September 1956, but was adopted in1960, after the setbacks of the GLF. As Kuo notes, there is no mention of Communes in the entire document (as they were established only in 1958) and the original 1955 draft was adopted without any significant changes. See Appendix in Kuo (1972) for the entire text of the NPAD.

43 Article 2 of NPAD details this northern region as North of Yellow River, the Qinling Mountains (Gansu Qinghai border in the West to Central Henan in the East just below where the North-South flowing stretch of the Yellow River sharply turns East) and Bailong River; and the Southern region as South of the Huai River, the Qinling Mountains and the Bailong River. The third region falls between these two regions i.e. the Huai and the Yellow Rivers and covers the northern parts of Anhui and Jiangsu and large parts of Henan and Shandong Provinces.

b. Expand irrigated area from 26 million ha in 1955 to 60 million hectares by 1967;

c. Increase fertilizer application from 0.8 million absolute tons in 1955 to 15 million tons by 1967;

d. Scientific farming and its wider dissemination along with soil and water conservation, expanding high yielding varieties and sown areas in more crop categories, improving farming techniques and tools, plant protection, besides enlarging the stock of draught animals and land reclamation.[44]

In addition to these thrust areas, the targets for expansion of cultivated area under State farms was fixed from under a million hectares to nearly 7 million hectares.[45] As regards, deployment of rural labour, Article 24 prescribed 250 days of work per male labourer (in 1956) and by 1962-63 at least 80-180 days for women in agriculture and/or sideline production. Other articles are devoted to housing, public health coupled with sanitation, nutrition and health care as well as provision of the "five guarantees" for all those categories of the population not part of the labour force. In order to evaluate the extent to which the goals of the NAPD were achieved, a brief summary of the overall economic performance followed by a discussion on the performance of agricultural sector until the mid-1960s is taken up below.

ECONOMIC PERFORMANCE 1949-65

Studies on China's economic growth and development divide the period 1949-65 into different phases. Eckstein (1977) identified six sub-periods.

First, Recovery and Rehabilitation (1949-52) included overcoming the problems of a war-torn, fragmented and inflation-ridden economy inherited in 1949 by restoring factories, railroads and other infrastructure. The emphasis was on increasing food

44 Besides these, specific articles cover each of the following: water conservancy (5), chemical and organic fertilizers (6), improvement of tools and extending use of new types of tools (7), expanding areas under improved seed strains suited to local conditions (8), developing mountainous areas, forestry and aquatic side lines (17, 18 and 19 respectively), improving meteorological and hydrological facilities (22), building grain reserves (25), improving communication facilities and infrastructure (3234), rural commerce and credit networks (35 and 36) etc.

45 This was to be achieved largely through land reclamation especially in the province of Heilongjiang besides Xinjiang. Though in terms of share in national grain acreage and output state farms were insignificant–in 1957, less than 1 per cent and 0.3 per cent respectively–in 1964, they were highly mechanized with 32 per cent of tractors, 50 per cent of mechanized farm tools, 82.5 per cent of combine harvesters, 68 per cent of heavy duty motor trucks besides a large proportion of irrigation, drainage and processing equipment as well as repair and maintenance workshops (See Kuo, 1972 40-42). Scientific farming was covered under Article 4 with a 12 point charter on its technical aspects.

production, textiles and other consumer necessities besides reforming the fiscal and monetary system. The National Budget Plan consolidated the central, provincial and local budgets.

Second, Plan Preparation (1953 to mid-1955) was the phase when Soviet aid was solicited to establish large-scale heavy industry. The private sector still accounted for 37 per cent of industrial output in 1953. The National Bureau of Statistics was established in 1952.

Third, the 'Big Push' development strategy (mid 1955–1956) was debated and full–fledged collective ownership of all non-agricultural sectors was launched. With a good 1955 harvest, state investment increased by 60 per cent over the previous year.

Fourth, 1957, the terminal year of the first Plan was a year of retrenchment with state investment being cut back following a bad harvest. Eckstein (1977: 200) notes that with the establishment of collective production in all sectors, "the Chinese economy emerged from this period with its systemic features quite crystallised". Between 1952 and 1957 urban population grew by 30 per cent compared to a 9 per cent increase in rural China.

Fifth, The Great Leap Forward (1958-1960) marked an ambitious program to accelerate both agricultural and industrial production. The emphasis was on expanding agricultural production to provide wage goods for industrialisation and serve as a domestic market for industrial products. A major program to industrialise rural China through small scale industry was also a key component of this strategy. With an exceptionally good harvest in 1958, an all out effort to mobilise labour in rural areas for capital, construction works was initiated. 1959 ended with a poor harvest due to bad weather. The capability of the newly established commune structure to meet ambitious targets was clearly an over estimation. 1960 also marked a watershed in Sino-Soviet ties with the withdrawal of all aid.

Sixth, The Great Crisis of 1960-1962 was due to a continuation of unfavourable weather affecting agriculture with a 30 per cent drop in farm production, with spread effects to other sectors. A serious re-evaluation of the development strategy was initiated that changed the focus towards the rural sector–a high priority to agricultural development, regional self-reliance in food production and a shift away from large scale heavy industry towards small and medium-scale industrial development.

Riskin (1987) proposed a similar though not identical division of the period 1949-1965, based on the changes in political policy and strategy. The formative three years of the People's Republic of China until 1952 is termed "State power and foundations of Socialism" and the next four years is a phase of "Mobilization

and Social Transformation. 1955-1957 is called a "Prelude to late Maoism–Socialist Transformation and Administrative Decentralization' while the "Great Leap Forward" (1958-62) is described as the "Ascendancy and Crisis of late Maoism". Finally, 1962-1965 is termed "Counter Currents: Economic Recovery".

A large volume of data was collated and published by the State Statistical Bureau in 1960 that became the first official detailed picture of structural transformation and pace of growth since 1949.[46] The first five year plan period (1952-1957) is widely regarded as the most impressive phase of economic transformation. The plan was based on the Soviet strategy of industrialisation involving massive investment in heavy industry and capital goods sector (with Soviet Aid). According to official figures as well as other estimates, National Income–equivalent to the sum of Net Domestic Material Product of all sectors except most services–grew at an average annual rate of nearly 9 per cent p.a.[47]While Gross Output value of industry including mining, manufacturing and utilities besides 'factory handicrafts'–grew at 18 per cent annually on average and the corresponding figure for 'modern' industry (excluding factory handicrafts) was over 20 per cent. Heavy industrial investment as a priority was assumed to have spread effects to agriculture and light industry and therefore "raise all boats together". Besides this, a further assumption was that rural surplus labour would be absorbed by the heavy industry–i.e. create sufficient employment.[48]

Ishikawa (1983) argues that there was a considerable transformation in the industrial structure during the first phase of industrialisation that continued until reforms.[49]Ishikawa (1983) further estimated that the relative weight of heavy industrial output in the total value of industrial and agricultural production increased from 9.6 per cent in 1952 to 20.6 per cent in 1966, the highest ratios among developing countries during that period. The corresponding figures for machine building industry in total industrial output increased from 11.4 per cent in 1952, to 17.3 per cent in 1965. As regards, employment there was a continuous increase in the absolute numbers employed in agriculture–173.17 million in 1952 to 233.98 in 1965. This share in total employment however, fell from 85.5 per cent in 1952 to 81.6 per cent in 1965.[50]

46 State Statistical Bureau (1960) *Ten Great Years*, Beijing.

47 Perkins (1980) estimated the average annual rate of growth of GDP for the same period at 8.3 per cent.

48 Gray (1978) notes that this strategy did not succeed in China just as a similar strategy in India was also unsuccessful. Further the labour absorptive capacity of modern industry was also a wrong assumption (p. 569). It must also be emphasized here that there were several problems with data estimates of this period, the major one being overestimation due to double counting.

49 Rawski (1978) has a more detailed examination of the development of capital goods industry.

50 Ishikawa (1983, CQ), Table 3, pp251

THE AGRICULTURAL SECTOR–1949-1965

The following table provides some important data relating to agriculture for the period 1952-1965. At the end of the first five year plan period in 1957, all variables show peak values and by 1965, only some of them display a recovery after the disruptive years from 1958 to 1960.

The economic performance of agriculture cannot be fully comprehended by the figures in the table for two reasons. First, consistent time series data for all relevant variables (in the table) are not available and secondly, data in numerical terms for all the aspects of the development experience in the period cannot be easily constructed. A more elaborate discussion of some important aspects of the development experience is provided below.

Table 1.1: China: Basic Statistics Relating to Agriculture 19521965

	1952	1957	1959	1962	1965
Total sown area (million ha)	141.26	157.24	142.41	140.23	143.29
Grain sown area*(million ha)	123.98	133.63	116.02	121.62	119.63
Grain output (million M Tons)	160.65	190.66	165.24	155.31	194.53
GOVA index 1952 comparable prices	100	128.71	113.91	115.2	141.39
Govt. exp. to support agri.(per cent total expenditure)	5.1	7.7	10.5	12.5	11.8
Agricultural Machinery (10000 Kw)	18	121	na	757	1099
Irrigated area (10000 ha)	1996	2734	na	3055	3306
Fertilizer, Total effective, 1000 tons	78	373	538	630	1942
Fertilizer per cultivated area, kgs/ha	na	2	4	5	14
Total Population (millions)	574.82	646.53	672.07	691.72	725.38
Rural population (millions)	491.91	540.35	536.4	575.88	604.16
Employment primary industry**(millions)	173.17	193.09	162.71	212.76	233.96

*GSA includes soya and potatoes**includes agriculture, forestry, animal husbandry and Fisheries

Source: USDA, ERS data sets and China Statistical Yearbook, various years

One of the remarkable achievements during the entire 1952-1980 period, was the harnessing of seasonal labour resources by active political mobilisation. The theoretical aspects of this unique Chinese experience are discussed more elaborately in the following chapter. Here, the focus is on labour mobilisation in activities concerned with agricultural and rural development. The Japanese prescription with regard to labour absorption in rice cultivation discussed earlier, formed one component of 'surplus' labour utilisation in China. The guiding principle was to utilize labour in other rural activities such as capital construction in water conservancy, land reclamation and

development, agricultural research and extension besides preliminary attempts at rural industrialisation directed towards agricultural production.

Beginning in the 1950s, until the late 70s (and even up to the mid-1990s), unprecedented numbers of peasants were mobilised during the winter seasons for the construction of major as well as minor water conservancy projects in rural areas and in road building and other construction works in urban areas. During the winter of 19571958 alone, about a hundred million people were mobilised for construction work.[51]

Several objectives were achieved through these efforts viz., effective utilisation of abundant labour by transforming labour directly into capital, increases in cultivated area and assured irrigation for an increasing proportion of the total cultivated area. The essence therefore, of the Chinese example in this regard was the practical demonstration of Nurkse's (1958) ideas regarding transforming disguised savings potential in disguised unemployment into effective savings.[52]

In the early 1950s the important strategy was to expand multiple cropping along with a gradual introduction of hybrid higher yielding varieties mainly in rice, cotton and wheat. Between 1952 and 1957 multiple cropping indexes went up from about 100-170 to 170-187.[53] High yield dwarf varieties (8 to 10 tons per hectare) with low maturity periods (80-100 days) were distributed until 1964 when the first breakthrough in full scale distribution of fertiliser-responsive high-yield varieties began. Increases in agricultural output and productivity came about through sustained increases in organic fertiliser application, soil improvement measures, and the intensive use of labour inputs into crop management practices. Organic manure use increased to 2072 million tons in 1979 and its use continued to rise, even after chemical fertiliser production had begun to expand rapidly from 729 million tons in 1952. Between 1958 and 1964, an average of 10 fertiliser plants per year were established. Compared to 1962, when domestic fertiliser production was 2.31 million metric tons, by 1965 it had more than trebled to reach a figure of 8.77 million metric tons.

The substantial role played by agricultural research also deserves mention in this context. The government placed high priority on development of agricultural sciences. In 1956, there were 14,000 agro-technical stations employing about 95,000 staff, to facilitate practical application of research. By 1963, about 100,000 had

51 Dutt (1967, p. 23)

52 Gray (1974, pp. 43) notes in this regard that even before the publication of Nurkse's theoretical model, "Mao had begun to act on assumptions similar to those of Nurkse's."

53 Stavis (1974) and (1978b, p. 632)

been trained in agricultural sciences and an additional 10,000 were involved in agricultural research in over 100 research institutes.[54]

Wiens (1982) notes that the high labour intensity in agriculture facilitated scientific enquiry and made evaluation of thousands of cross breeds by the cultivators themselves across the entire countryside possible.[55] The major breakthrough in agricultural research was the development of a high yield rice variety in 1964, two years ahead of its equivalent, the IR8 that launched the green revolution in the rest of Asia.[56]

Given labour abundance, the small size of plots characterising most of Chinese agriculture (terraced fields that do not permit enlargement) and the complex patterns of intercropping, the need and scope for conventional mechanisation of agriculture was limited. Further, shortages of inputs for producing agricultural machinery as well as for its operation left the only choice of raising current inputs - fertiliser, water, pesticides and labour intensity for weeding, crop management etc. - in order to increase output. There were considerable differences within the Chinese leadership on the issue of agricultural mechanisation and until the mid-1960s mechanisation increased rather slowly.[57] However, seasonal labour shortages resulting from increases in multiple cropping which required intensive effort in harvesting, field preparation and planting during the switch over period from one crop to the next provided some scope for mechanisation. A ten year plan for agricultural mechanisation launched in 1959, with a target of complete mechanisation, achieved only 10 per cent due to the economic crisis following the Great Leap Forward.

Tractor ploughed area increased by almost 6 times and power irrigated area by more than 5 times between 1957 and 1965, the former from 26.36 million hectares to almost 156 million hectares and the latter from 4.4 per cent to 24.5 per cent of total irrigated area. Rural small hydroelectric power stations which numbered 544 with a capacity of 20,000 kW in 1957 rose respectively to 7436 and 252 kwh in 1962. Correspondingly, rural electricity consumption during the same period rose from 0.14 billion kwh to 1.61 billion kwh. But the real spurt in these indicators of mechanisation came about after 1965.

Despite the enormous efforts in all areas of agricultural and rural development, by 1965, the immediate role of agriculture, namely to provide for an adequate if not increasing amount of food per capita was not entirely fulfilled. Food grain production

54 Data from Cheng Chuyuan (1965); Stavis (1978b); Leo Orleans (1961).

55 Wiens in Barker et al (ed.) (1982: 117).

56 The Chinese variety matured 10 to 15 days earlier than the IR8, see Stavis (1978b: 638).

57 Stavis (1978a) has reviewed the political aspects of these debates within the Chinese Communist Party.

per capita in 1965 stood at 272 kgs, less than the 288 kgs in 1952, according to official Chinese statistics.[58]In terms of nutritional availability per capita, however, the total energy from all sources of food showed a marginal increase from 1861 kcal to 1967 kcal in the respective years, an increase of 6 per cent. The improvement in availability of protein in the respective years–51grams to 53 grams and fat–24 grms to 22 grams–was almost negligible.[59]Changes in nutritional endowments and entitlements for the periods 1965-1980 and 1980-2005 are taken up for a detailed study in later chapters.

The following chapter examines developments in Chinese agriculture between the mid–1960s until the initiation of de-collectivisation, which was the central agenda of reforms during 1978-80.

Table 1.2: China: Aggregate and Per Capita Food Grain Production and Daily Per Capita Availability of Nutrition, 195265

	Aggregate Output (Million Metric Tons)	Output Per Capita (Kgs)	Daily Nutrition Per Capita		
			Total Energy (KiloCalories)	Total Protein (Grams)	Total Fat (Grams)
1952	163.92	288.00	1861	51	24
1953	166.83	287.00	1879	50	23
1954	169.52	285.00	1895	50	24
1955	183.94	302.00	2005	53	25
1956	192.75	310.00	2051	53	24
1957	195.05	306.00	2045	55	24
1958	200.00	306.00	2053	54	26
1959	170.00	255.00	1722	46	22
1960	143.50	215.00	1453	39	16
1961	147.50	223.00	1558	43	16
1962	160.00	240.00	1660	45	17
1963	170.00	249.00	1776	45	19
1964	187.00	269.00	1934	50	22
1965	194.53	272.00	1967	53	22

Source: World Bank (1984)

58 *Statistical Yearbook of China* (1983), State Statistical Bureau, Beijing.
59 Data from Piazza (1983)

2. Agrarian Transformation in Pre-reform China, 1965-1980

INTRODUCTION

This chapter examines changes in China's agricultural sector and the rural economy (together) between the mid-1960s until the late 1970s. Most studies conducted prior to the early 1980s relied on a rather limited set of published resources, particularly statistical data required for economic research. A considerable amount of data however, became available in the 1980s with the publication of *Statistical Yearbooks* at the national, provincial and lower levels of administration, as well as other historical statistics pertaining to different sectors of the economy compiled from various sources.

The period 1965-1980 was identified for the following reasons. First, major organizational/institutional changes in agriculture were effected around the mid 1960s. These changes included a reorganization of production, planning and control between the three sub-provincial levels of commune, brigade and team. Though the changes did not alter the overall structure of planning, the reorganization was intended to achieve an effective implementation of policy by allowing decision-making regarding production at the farm/village or at the administrative and team levels. These changes represent a culmination of experiments with various organizational methods, forms and strategies some of which encountered serious setbacks and extreme failures in the earlier decade.

Secondly, the priority of agriculture and in particular, grain production was given greater emphasis following the adoption of the National Programme for Agricultural Development in April 1960 by the National People's Congress. In the following years effective implementation of the major components of this programme was undertaken. Thirdly, beginning in the mid-1960s, major breakthroughs were achieved in high-yielding rice varieties, following the expansion of irrigation, drainage systems, use of chemical fertilizers and more intensive methods of cultivation. The technological shifts were accompanied by an increase in the intensity of cultivation through multiple cropping, thereby increasing the total sown area. Further, policies formulated earlier with regard to mechanization of the more labour intensive farming activities began to be implemented vigorously during this period. Fourthly, a large number of water control projects were initiated in order to expand irrigated areas-a

fundamental requirement for the adoption and effective realization of gains from modern high-yielding varieties of grains. Finally, an integrated rural industrialization and development strategy was re-launched based on the lessons learnt from earlier experience. Statistical data sets pertaining to this period made available in the 1980s and the 1990s compel a re-examination of propositions and hypotheses that have been put forth regarding the achievements in the rural economy.

THE ECONOMIC RATIONALE OF COOPERATIVE PRODUCTION

As noted in the previous chapter (section 1.4), land ownership was highly concentrated in China before agrarian reforms. In 1934, the top one-tenth of rural households owned over half of the total cultivated area, while the poorer majority, seven-tenths of all households accounted for just a quarter. These data exclude landless agricultural labourers.

The highly feudal character of rural China severely constrained the possibilities of expanding investment, promoting innovation and thereby enhancing growth. The main forms of appropriation of economic surplus were landlord rents, and moneylender interests, while the profit element was small owing to the relative rarity of cultivation for profit with hired labour. Traders' margins were also high. As Riskin (1987: 32) notes, "High rates and increasingly insecure tenancy discouraged investment by peasants, while fragmented holdings discouraged technical innovation. Where commercialisation might have stimulated investment innovation and specialisation, inadequate credit and high interest rates made borrowing for such purposes a major gamble..."

Patnaik (1998) points out that "the problem then, to begin with, is how to transform the socially unproductive forms of actual economic surplus into socially productive forms in such a manner as to widen the social base of investment to the maximum possible extent"[1]. China followed the path of radical redistributive land reforms, which completely eliminated land rent and moneylender interest as economic categories thus relieving the peasants from the burden of paying out surplus to the property owners. The economic surplus so released could raise consumption levels of producers and partly be mobilised through taxation for investment, both within the agricultural sector and outside it.

The direct benefits that accrued from the land reform translated into higher investment as well as higher levels of consumption during the early 1950s. In his pioneering work, Lippit (1974) estimated that land reforms redistributed 13 per cent

1 Patnaik (1998: 228-229).

of net domestic product in 1952. Peasants' disposable income rose by a quarter after taxes and compulsory procurement at low prices.[2] Further, an estimated 16.9 per cent of value added (or net income) in agriculture in 1952, was realised as surplus that under the earlier institutional arrangements would have accrued as land rent, usury interest and profits. An additional 2.1 per cent of net agricultural income, which was the equivalent of the tax paid by owner-operators in the earlier system, brought up the estimate of surplus realised from agriculture to about 9.4 billion Yuan (at 1952 prices). Of this 4.9 billion Yuan was taxed away by the new government leaving 4.5 billion as additional income to the peasants. This transfer from the agricultural sector to the state amounted to almost 45 per cent of net domestic investment in 1952.

However, following land reforms, the scale of individual peasant production still remained small and investment in indivisible irrigation assets to raise productivity was severely limited. Moreover, the problem of under-employment of labour remained acute. The rationale of a larger cooperative scale of production was to pool small individual resources for investment, and rationalise labour deployment so that some workers could be withdrawn for capital formation projects, while others maintained crop production.

As explained earlier, there was a step-by-step implementation of cooperative production, starting with the mutual-aid teams to the lower-level agricultural producer cooperatives (APC). By the end of 1954, there were close to 114,000 APCs, of which the higher-level agricultural cooperatives (HAC) numbered only 200. In the latter form, compensation for land and equipment contributed to the cooperative by the household, was no longer re-distributed as in the case of lower-level agricultural cooperatives (LAC), marking a genuine socialisation of assets.

The original approach to consolidating a full-fledged socialist collective agriculture (from which the HAC were only one step away) was a cautious one. Under the schedule outlined at the end of 1953, complete socialisation of agriculture, was to be achieved by 1968, over the course of three five year plans. But the strategy was modified and the drive to rapid collectivization was launched much earlier in 1955. By the end of 1956, 120 million agricultural households, or 96.3 percent of China's rural families, were organized in 750,000 co-operatives, of which 88 percent were fully socialist HACs. In 1958, dozens of these were further amalgamated into the Rural People's Communes (RPC) numbering 26,000 by the end of the year, each with an average of 25,000 people (or roughly 4,600 households). By 1958, about 98 per cent of China's rural population were part of the RPCs that combined political, administrative,

2 Similar estimates are provided by Perkins (1975: 176). Riskin (1987, chap. 4) also discusses at length these aspects of the earlier phase of land reforms and co-operative institutions.

judicial and military functions in one organizational unit. Economically, however, the principal internal unit in each commune was the production brigade, which often corresponded to a HAC.

In addition to the fundamental goal of socialist collectivisation, namely to transform a highly unequal society to one based on an egalitarian system of production and consumption, three important objectives were sought to be realised. First, improving the productive capacity of agriculture by pooling labour and other resources and thereby expanding the production frontier. Secondly, mobilising and deploying seasonally under-employed labour towards improvement of land and water conservancy infrastructure, thereby strengthening the base of agricultural capital as well as enhancing availability of other inputs. The third objective was recovering resources at the aggregate level from the surplus of production over consumption and directing the same towards investments in industrial capacity as well as expanding rural consumption.

The first objective of raising the productive potential of agriculture went beyond the economies of scale that could be realised by combining smaller parcels of land and pooling labour and other resources through collectivisation. Under a system where the predominant operational unit comprised peasant households subsisting on small farms, the scope for investment to enhance the productive potential was severely limited. Further, the smaller size also prevented adoption of new technology that comes at higher input costs, besides lumpy investment that is both beyond the economic reach as well as uneconomic with regard to the small scale of operations. Thus in a context of a highly skewed distribution of income and assets, only the richer peasants with larger land holding would have the capacity to invest (as in the case of India). Agricultural mechanisation, therefore, could increase unemployment and cause social distress, even if it raises farm output and productivity.[3] Collectivization effectively overcomes these barriers. Inherent in the above argument of the advantages of scale that collectivization ensures, there is also the issue of the institutional context in which new technology is adopted.

The second objective of effectively utilising under-employed labour for maintaining and expanding irrigation infrastructure (and reducing the impact of recurrent floods), enhances the productive potential and at the same time enables utilisation of labour time that would otherwise remain under-utilised. Collectivisation allowed the conversion of an apparent liability into an asset: by directly transforming under-

3 In the context of India, Pakistan and parts of Latin America, landlords monopolized the benefits of mechanization and tenants suffered as mechanization of agriculture resulted in unemployment and social distress (Stavis 1978: 16,18).

employed surplus labour into capital at minimal extra cost, laying a firm basis for agricultural productive transformation which fed into industrial growth, as well as gains in human development indicators.Patnaik (1988) notes in her account of several communes visited in 1983, that the collective income of the commune was divided into three parts–first, of the total commune income generated in a year, between 80 percent in advanced areas, to over 90 percent in more backward ones, was distributed as *income* to the members; second, the balance was divided between an *accumulation fund* (out of which capital construction in agriculture as well investment in village industry was undertaken) and a *welfare fund* for the construction of clinics, schools and entertainment facilities for the members.[4]

The question of potential economic surplus that could be realised by mobilising under-employed labour is taken up in the next chapter.

PERSPECTIVES ON PRE-REFORM CHINA

There is a convergence between the conclusions derived by most Western evaluations and in the official position on the Chinese economic performance, from the mid-1960s until the late 1970s. As Kueh (2006:701) notes, "[T]o many Western scholars and analysts, and indeed to many of their Chinese counterparts, the conclusions", (with regard to the three decade long collective agriculture), "are as follows: collectivization impaired peasant incentives; rural bureaucratic control and non-market methods distorted the allocation of resources and inhibited productivity growth; the drive for grain self-sufficiency, especially during the Cultural Revolution, retarded rural specialization and intra-regional exchange; and above all, agriculture was consistently undervalued in the national scale of investment priorities.

Taken together, agricultural collectivization/communization is thus seen to have been responsible for the slow growth or stagnation of Chinese agriculture, and hence of depressed peasant income, widespread poverty and even prolonged malnutrition for many"[5].

Official Chinese statements on pre-1978 policies, especially with regard to the rural economy are generally derisory. The Cultural Revolution period[6] in particular,

4 See Tables 8 to11 on pages 50, 53, 55 & 58 respectively. Patnaik (1988) notes further, that even though the household contract responsibility system was introduced as early as 1979, the basic structure of the commune remained intact for several years after that (Ibid:59).

5 Kueh, (2006: 71) CQ.

6 The period of the Cultural Revolution (CR) varies across the literature. Publication of a poster directed against the head of Peking University on 2 June 1966 is generally regarded as the beginning of the CR while the formal adoption of the official Circular launching the CR was on August 8. Riskin

is viewed as one of severe economic disruption throughout all the economic sectors. The official term used to describe the period 1965-76 is *shinianhaojie* that roughly translates as 'ten-year calamity' or 'the lost decade'.[7] Bramall (2000) however, notes: "Most theorists and members of the Party were united in giving to the Maoist development strategy much of the credit for what was achieved despite the deficiencies". In recent years, however, contrary to the official position, this period has been evaluated positively even within China.[8] One example is He (2006: 48), who argues that the agricultural sector during this period was dynamic and that political interference and impact on production was minimal in this sector. In fact, there was a rejuvenation of the rural non-agricultural sector beginning in the mid-1960s laying a sound foundation for the impressive performance in the 1980s and the 1990s.

"The social order of the countryside remained virtually without disruption, and the peasants continued undisturbed in their farming while at the same time beginning to run industrial enterprises again… The enterprises built by the people's communes and production brigades during the "Cultural Revolution" served as a foundation for the future TVE's".[9]He (2006) lists two important factors that the agricultural sector benefited from:

1. The policy of sending urban youth to resettle in rural areas: 10 billion Yuan was provided by the State, public institutions and State enterprises for the resettlement project, involving18 million young students that included 2 million sent to State farms and production and construction corps and,
2. The agricultural mechanisation drive beginning in the early 1970s with the September 1971 National Conference on Agricultural Mechanisation that set the target for 70 per cent mechanisation in all major productive activities in farming, forestry, animal husbandry and fisheries within 10 years.

The strategy involved:

i. Building of a repair network at all three levels of county, commune and brigade,

ii. Development of the "five small" industries–small blast furnaces, small coal mines, small machine-building factories, small cement plants and small chemical plants,

(1987: 186) notes that "the Cultural Revolution proper lasted about three and a half years, from late 1965 to early 1969, although its acute phase was considerably shorter".

7 The term *haojie*, as Gao (2008) explains, is ambiguous as it can refer to "holocaust" in the modern sense or traditionally to a "great calamity".

8 Bramall (2000: 130).

9 He (2006) is published by a government agency and can be regarded as an indication of official tolerance of the current regime of such an evaluation. The quotations are from pages 46 and 47.

iii. Mechanisation of processing of farm produce and sideline products, cold storage and transportation and

iv. Priority to the supply of small farm tools and improved small tools.

Gao (2008) goes beyond the evaluation of production in the industrial and rural sectors and argues that "there is plenty of evidence that supports the known story in which hundreds of millions of people were affected positively. The increase of life expectancy in the era of Mao alone, …has given an estimated 35 billion collective years of life to the Chinese people".[10] Besides significant increases in life expectancy, other major achievements in that period include expansion of elementary education in rural areas, the provision of universal cheap and effective health system, policies to promote greater participation of women at all levels of economic, political and social life besides the establishment of key defence infrastructure in the international milieu of the cold war.

Life Expectancy at Birth (years)

China, 1949	32
China, 1957	57
China, 1978	65
India, late 1970s	51
Pakistan, late 1970s	49
Indonesia, late 1970s	52

Source: UN Population Yearbook, Various years.

In the words of Putterman (1992: 470), "The distributive achievement permitted extraordinary progress to be made in life expectancy despite income levels that were low by world standards and that remained basically stagnant from the mid 1960s to 1978."

The Chinese economy during the CR period, in terms of establishment of core industrial production capabilities and agricultural capital infrastructure, besides major improvements in agricultural technology, advanced sufficiently to become the foundation on which rapid growth was possible in more than two decades since 1980.[11] It must be also be mentioned however, that the decade beginning in the mid-sixties was a period of intense political struggle within the Party stemming from basic

10 Gao (2008) p. 19, quotes Frank Willems (2005) *Mao: the Untold Story*, (http://sf.indymedia.org/news///.php) accessed on 20.11.2005.

11 This is also noted by the Joint Economic Committee (1975) report. Gao (2008) does not deny disruption to the economy and society that resulted from the intense political movement initiated during the GPCR.

ideological positions that had an impact on the broad economic strategy as well as on economic and social organisation.[12]

INSTITUTIONAL RE-ORGANIZATION IN AGRICULTURE–EARLY 1960S

The destabilization that resulted from the Great Leap Forward (GLF) strategy (1958-60) was attributed, amongst other factors, to the large scale of the collective units–communes–that posed serious challenges to management, mobilization and coordination both within the units and across sectors. Further, as noted in the previous chapter, the GLF ended with the withdrawal of Soviet technical assistance leaving behind a considerable financial burden in the form of loans. The 'international isolation' of China was almost complete and as discussed in a later part of this chapter, the 'threat perception' within China was such as to drain the economy of a large quantum of investible funds, which were diverted to the establishment of the "Third Front construction" in the interior regions consisting of defense and related industries.

During 1960-62–referred to earlier as the 'Great Crisis'–unfavorable weather had a severe impact on agricultural production, the effects of which were significant on other sectors. Vermeer (1977: 25) refers to the years 1960 and 1961 as China's leanest years in terms of weather conditions. In 1962, the strategy of "agriculture first" was adopted to provide for higher investment outlays for agriculture as well as reorienting industrial production towards agricultural input needs. In the following year, devastating floods in North China forced the adoption of a stabilization policy within the above framework. This policy was concentrated on those agricultural areas that were most productive due to natural endowments.[13]

In retrospect, it appears that institutional re-organization became a necessary condition to recover from the crisis and bring the economy in line with longer-term objectives formulated earlier. Following the adoption of the NPAD in 1960, implementation began in the following years with rural development and agricultural transformation as the overall strategy. Perhaps the most significant institutional re-organization within the broad policy of de-centralization in 1963 was the designation of production teams as the basic accounting units. This meant that the actual decisions regarding farm production were vested at the level of the natural village

12 There were debates within the Party establishment on various aspects of socialist organization of production during this period. See Riskin (1987) for some of the debates.

13 See Erisman (1975) for an examination of the policy developments in this regard during the 1960s. See also Sigurdson (1978: 677) for a brief discussion on the transition around the mid 1970s, from the team to the brigade as the basic accounting unit.

(or the production team). Besides, households were permitted to engage in limited sideline activities on private plots (that could not exceed 5 per cent of land cultivated). This did not mean an abolition of communes, which happened much later towards the early 1980s, but reduction in their size to a level corresponding to the APCs of the early 1950s and redefinition of their administrative authority and control. The Production Brigades were assigned the task of organizing cooperation among teams and running industry that was jointly owned by many teams.[14]

Though institutional re-organization was effected in the early 1960s, the core elements of the strategy in many respects were the same as during the GLF, namely labor-intensive accumulation towards industrializing the rural economy and transforming agriculture by extending irrigation networks, appropriate mechanization and adapting modern agricultural techniques/technologies to Chinese conditions. Bramall (2006) notes that the strategy between the mid-1960's and the 1970s was the second attempt with the same strategy that failed earlier but this time was successful in widespread development of rural industry, expansion of irrigated area and ultimately enhancing rural living standards.

By 1965, Chinese agriculture had largely recovered from the crisis of the late 1950s with changes in organization of production as well as larger support to agriculture from the industrial sector. By 1965, the institutional reforms undertaken in the early 1960s had put in place a structure more decentralized than the RPC system. Production teams that hierarchically functioned below the RPCs, became the new unit of accounting for purposes of production decision, consumption needs and distribution of income. The *Regulations on the Work of the Rural People's Communes* introduced in 1962, laid down the operational mechanisms of the new structure. The functions of the production teams (and below them the production brigades) were significantly altered. These reforms were major in terms of altering the conditions of production and consumption and viewed in retrospect, the next major phase of reforms beginning in the late 1970s, appears as part of a logical sequence.

In the next section, an evaluation of China's overall economic performance and that of the rural sector during 1965-80 is made, followed by an exploration of some theoretical themes and perspectives that the Chinese experience has evoked.

ECONOMIC GROWTH AND STRUCTURAL CHANGE: 1965-78

By developing country standards, China's overall economic growth as well as sectoral performance for the period 1965-80 was exceptional. This has been confirmed by

14 See Kuo (1972) for an elaborate discussion on this issue.

various studies based on a careful examination of the data that emerged since the mid-1980s. The exception was however with regard to food production, which has been taken up for a detailed examination in Chapter 4.

Industry, particularly manufacturing and machine building, recorded far greater rates of growth relative to other sectors. Rawski (1980) provides an elaborate and detailed account of the evolution of the capital goods sector until the late 1970s. It is clear from this study that, by 1979, China's basic industrial infrastructure was firmly in place for a sustained take-off. This is confirmed by Chart 2.1, which plots the share of primary, secondary and tertiary sectors in GDP at constant prices, based on time series data in Hsueh and Li (1999). The share of secondary industry by 1978 was over 60 percent of GDP, while the share of primary industry in GDP had declined to less than 15 percent. The decline in the primary sector was largely offset by rise in secondary sector's share as the share of tertiary sector declined more slowly. The share of tertiary sector remained around 26 per cent on average during 1965-69 but fell to 22 per cent by 1974, as remarkable increases in industrial output pushed the share of secondary sector to account for more than three fifths of the economy.

Table 2.1: China: Growth Rates of GDP and Its Components, 1952-80 (% pa)

(At comparable prices, 1952 = 100)	**1952-80**	**1964-79**	**1968-79**
Gross Domestic Product	5.5	6.4	6.7
Primary industry	2.3	2.6	2.5
Secondary industry	9.1	9.7	10.1
Industry	9.5	10.0	10.4
Construction	5.7	6.7	7.2
Tertiary industry	4.4	5.2	5.6
Transportation, post and telecommunications	5.9	7.2	7.6
Commerce	3.1	5.4	5.6
Social services	4.5	5.7	6.6
Public utility	6.8	4.0	5.2
Banking and insurance	6.1	2.3	3.3
Real estate	5.2	5.4	4.0
Science, education, culture, health, sports and welfare	5.8	4.7	5.4
Government agencies*	3.8	4.6	4.6
Per capita GDP	3.5	4.2	4.6

Note: Growth rates estimated using least squares method, * includes party agencies and social organizations and others

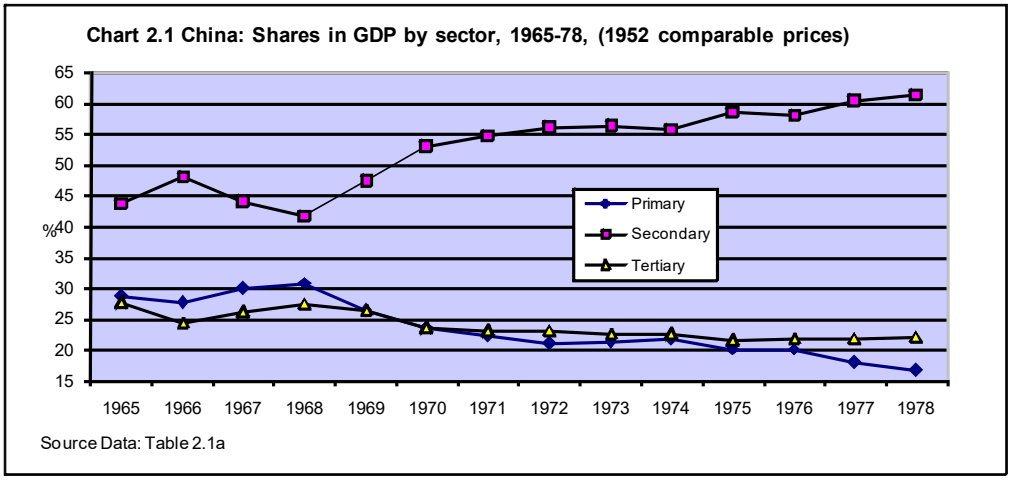
Source data: Hsueh and Li (1999).

Table 2.1a: China: Sectoral Shares in GDP, 1965-78

	Primary	Secondary	Tertiary
1965	29	44	27
1966	28	48	24
1967	30	44	26
1968	31	42	27
1969	26	47	26
1970	24	53	24
1971	22	55	23
1972	21	56	23
1973	21	56	23
1974	22	56	22
1975	20	59	21
1976	20	58	22
1977	18	60	22
1978	17	61	22

Source data: Hsueh and Li (1999)

Ishikawa (1983: 246) notes that the industrial structure underwent considerable transformation during the first plan period as well as during 1966-76. The standard Chinese indicator in this regard is the relative weight of heavy industrial output in the total value of industrial and agricultural production. This share increased from 20.6 per cent in 1966 to 40 per cent in 1976 and that of machine building industry in total industrial output increased from 17.3 per cent in 1965 and to 27.7 per cent in 1975.[15]



15 Ishikawa (1983: 245) Table 2.1.

A direct explanation for such high growth rates–especially in the industrial sector–is found in the high levels of accumulation in total national income during the period. From a rate of over 80 per cent in 1963, consumption as a share of national income consistently declined over the period to around 65 per cent in 1979. Correspondingly in 1979, 35 per cent of national income was provided for accumulation (Table 2.2). As regards personal consumption, the share of urban (non-agricultural) population was higher in all sub-periods excepting 1963-70, relative to rural personal consumption. This is evident from the growth rates of the respective components of consumption presented in Table 2.3.

Table 2.2: National Income, Consumption and Accumulation, 1963-79

	*NI used.	Consumption (C)	Accumulation (A)	%C in NI	%A in NI
1963	104.7	86.4	18.3	82.5	17.5
1964	118.4	92.1	26.3	77.8	22.2
1965	134.7	98.2	36.5	72.9	27.1
1966	153.5	106.5	47.0	69.4	30.6
1967	142.8	112.4	30.4	78.7	21.3
1968	140.9	111.1	29.8	78.9	21.1
1969	153.7	118.0	35.7	76.8	23.2
1970	187.6	125.8	61.8	67.1	32.9
1971	200.8	132.4	68.4	65.9	34.1
1972	205.2	140.4	64.8	68.4	31.6
1973	225.2	151.1	74.1	67.1	32.9
1974	229.1	155.0	74.1	67.7	32.3
1975	245.1	162.1	83.0	66.1	33.9
1976	242.4	167.6	74.8	69.1	30.9
1977	257.3	174.1	83.2	67.7	32.3
1978	297.5	188.8	108.7	63.5	36.5
1979	335.6	219.5	116.1	65.4	34.6

Note: National income (NI) used is not identical to National Income due to exclusion of Net Imports and statistical discrepancies. Column 1-3 figures in billion Yuan, Columns 4-5 in percentages.

Source: China Statistical Yearbook, various years.

High rates of investment by itself may not translate into high rates of growth of national income, if the investment-effectiveness parameters are not favourable. Ishikawa (1983) examines this issue with estimations of four indicators for various sub-periods between 1953 and 1979-the marginal-output investment ratio for the entire economy, for the construction sector, the rate of fixed capital formation and marginal output-fixed capital assets ratio. The conclusions were that excepting the period of the second five-year plan (1958-62) and the years of adjustment (1963-65) during

which there were violent fluctuations in all variables, "marginal output-investment ratio systematically declined sufficiently to outweigh the rate of increase in the rate of domestic investment"-thus annual average rate of growth of national income did not show any increasing trend after the period 1952-57 (the first five-year plan). The same was true of the marginal output-capital construction investment ratio.[16]

Table 2.3: China: Growth of Consumption, 1953-80

	Total Consumption	Public Consumption	Personal Consumption		
			Total	Agricultural Population	Non-agricultural Population
1953-57	6.5	5.8	6.6	5.1	9.8
1958-62	-2.0	3.4	-2.5	-3.3	-1.2
1963-65	11.0	8.9	11.2	12.2	9.6
1966-70	5.0	5.7	4.9	5.5	3.9
1971-75	4.9	8.6	4.5	3.8	5.8
1976-80	6.8	11.2	6.2	5.2	7.9

Note: Growth rates are at comparable (1952) prices. Public consumption is equal to total consumption minus personal consumption.

Source data: China Statistical Yearbook, 1993

While, output-capital ratio often shows a declining trend with progressive capital accumulation (accompanying increases in the capital-output ratios), the rural industrialization strategy (to be discussed later) was accompanied by a large fiscal deficit. There was also a major drain of investment funds during 1964-75 towards establishment of defense related sectors in the interior regions ("Third Front Construction") arising out of China's international isolation and perceived threats to security in that period. Roughly half of total capital construction expenditure in the period is estimated to have been diverted towards the establishment of the "Third Front" industries. It has been argued that this investment was not entirely unproductive and some benefits accrued in later years when reforms were initiated.[17]

As regards growth of the labour force, between 1963 and 1979, there was a net addition of over 139 million; around two-thirds of this in the rural and the rest inthe urban sector (Table 2.4).

16 See Ishikawa (1983: 256). The quotation is from p. 257.

17 Bramall (2006) refers to the Feldman model, which delineates the essence of the centralized physical planning system as the basis on which the Chinese central planners accorded high priority to investment, where high allocation to investment goods sector can prove to be beneficial in raising consumption in the medium and long term if the marginal output-investment ratio is held stable as the increases in per capita income in the medium and long term would outweigh the reduction in consumption in the short runto enable high investment levels.

Table 2.4: China: Labour Force and Participation Rates, 1963-79

	Labour Force (thousands)			Participation Rates*		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1963	266400	46030	220370	0.39	0.40	0.38
1964	277360	48280	229080	0.39	0.37	0.40
1965	286700	51360	235340	0.40	0.39	0.40
1966	298050	53540	244510	0.40	0.40	0.40
1967	308140	54460	253680	0.40	0.40	0.40
1968	319150	56300	262850	0.41	0.41	0.41
1969	332250	58250	274000	0.41	0.41	0.41
1970	344320	63120	281200	0.41	0.44	0.41
1971	356200	68680	287520	0.42	0.47	0.41
1972	358540	72000	286540	0.41	0.48	0.40
1973	366520	73880	292640	0.41	0.48	0.40
1974	373690	76870	296820	0.41	0.49	0.39
1975	381680	82220	299460	0.41	0.51	0.39
1976	388340	86920	301420	0.41	0.53	0.39
1977	393770	91270	302500	0.41	0.55	0.39
1978	398560	95140	306380	0.41	0.55	0.39
1979	405810	99990	310250	0.42	0.54	0.39

Note: Participation rates are calculated using respective populations of urban, rural and total. Labour data follows the pre-1985 labour force definitions. Population data includes military personnel. Detailed definitional issues treated in the source.
Source: USDA, ERS

Additional employment in agriculture between 1965 and 1978 was about 61 million persons. Although the absolute numbers employed in agriculture rose from 233.98 in 1965 to 294.26 in 1978, the share in total employment fell from 85.5 per cent in 1952 to 81.6 per cent in 1965 and further to 73.8 per cent in 1978.[18]

The broader issues concerning deployment of labor resources (rural surplus labor problem) given technical conditions (labor to land ratio or labor to capital ratio) and that of employment as an entitlement to livelihood guaranteed by socialist principles are taken up in the next chapter. The next section takes up for discussion agricultural growth during 1965-79.

18 Ishikawa (1983: 251, CQ), Table 3. See ibid for 'de-urbanisation' during 1966-76, when transfer of youth from cities to the rural areas was effected and policies with regard to stringent residency requirements checked the growth of urban population.

GROWTH OF AGRICULTURE: 1965-79

Lardy (1983) estimated agricultural growth for the 1960s and the 1970s to have been the same or even below that achieved during 1953-57 (at about 3.5 per cent) and argued that direct quantitative planning and bureaucratic control impaired peasant incentives, distorted cropping patterns and hence depressed agricultural productivity.[19] There are four issues that need to be considered–one concerning what may be called the base year problem[20], growth beginning from lower initial level as well as at lower labour or population per unit of land in the earlier period. Secondly, the indigenous development of highyielding varieties took off only by the late 1960s and being a continuing process conditioned by the requirement of higher levels of inputs-fertilizers as well as water control, the full benefits began to be realised only by the early 1980s; thirdly, distorted cropping patterns imposed by the policy of local grain self-sufficiency-predominance of food grains at the cost of diversification into high value crops-was a direct consequence of the shortage and slow growth in food production experienced earlier. It may also be added that international isolation also took the form of limited participation in international grain markets. Lastly, the question of peasant incentives being impaired originates from the conception that only prices (and the existence of free markets) can guarantee incentives. These issues are taken up for discussion in the following section that examines statistical evidence as regards changes in sown areas, outputs and inputs.

Sown Areas

Total sown area (TSA) attained a maximum reaching 159 million ha in 1956/7. The area sown devoted to grain was also the highest in that year at over 136 million ha. However, it had begun to decline to around 140 million ha during 1962-63. In 1963, it stood at 143.3 million ha (Table2.5). As chart 2.2 shows in the period 1965-79, after reaching a low of 139.8 million ha in 1968, there was a consistent and gradual increase until 1977 of grain sown area (GSA, grain here refers to the Chinese official definition that includes potatoes and soybeans besides all other fine and coarse grains).

TSA and GSA followed an identical trend in the entire period though the share of grain in the former declined from 85 per cent to 80 per cent around the end of 1970s (Table 2.5). The same table reveals an interesting trend regarding the annual average

19 Lardy's (1983: 86-87) estimation of total factor productivity for the 1960s and the 1970s showed a decline relative to the 1950s. Kueh (2006: 716) argues that both the data on costs as well as assumptions regarding weights for labour, land and capital inputs give rise to the decline in Lardy's estimation. These are amenable such as to generate an increase in TFP.

20 Here the reference is not to the conceptual problems associated with statistical analysis concerning choice of a base year to normalize for price changes or similar exercises.

change per year in TSA and that devoted to grain during 1964-79. Whereas, there was an addition of about 190,000 ha per year on average to the TSA, an almost equal area–189,000 ha per year–was diverted away from grain production in that period thereby adding 380,000 ha to non-grain crops.

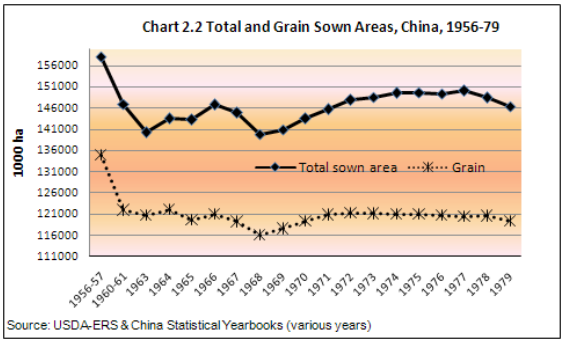


Table 2.5: China: Sown Areas and Annual Changes 1964-79, 1000 ha

	Total	Grain	Grain Share (%)	Annual Change	
				Total	Grain
1956-57	158209	134986	0.85		
1960-61	146928	121931	0.83		
1964	143531	122103	0.85		
1965	143291	119627	0.83	-240	-2476
1966	146829	120988	0.82	3538	1361
1967	144943	119230	0.82	-1886	-1758
1968	139827	116157	0.83	-5116	-3073
1969	140944	117604	0.83	1117	1447
1970	143487	119267	0.83	2543	1663
1971	145684	120846	0.83	2197	1579
1972	147919	121209	0.82	2235	363
1973	148547	121156	0.82	628	-53
1974	149545	120976	0.81	998	-180
1975	149723	121062	0.81	177	86
1976	149333	120743	0.81	-389	-319
1977	150104	120400	0.80	771	-343
1978	148477	120587	0.81	-1627	187
1979	146379	119263	0.81	-2097	-1324
Average Change Per Year (1964-79)				**190**	**-189**

Source data: USDA:ERS and China Statistical Yearbook, various years.

However, a closer examination of the various grains reveals what has been termed 'distortion of cropping pattern" brought about by policy (Chart 2.2a). Table 2.5b shows that there was an annual average reduction of around 533,000 ha in the coarse grains area sown, which was more than compensated by an average annual increase of 284,000 ha and 263,000 ha in rice and wheat respectively during 1964-79. The net reduction per year of 189,000 ha in GSA in this period was slightly below the reduction in the sown areas of soybeans and tubers together (184,000 and 20,000 ha respectively). It must be mentioned however, that among the coarse grains there was an annual average increase in sown area of corn of 478,000 ha over the period 1971-79, a large part of it in two years–1967 and 1975-when there was an increase of almost 1.2 million ha (or 7 per cent). The reason behind this was an expanding demand from the feed sector brought about by a shift in emphasis on meat, poultry and pork production. Total output of pork, beef and mutton in the years 1978 and 1979 were of the order of 763,000 tons and over 2 million tons respectively-a 9.8 per cent and 24 per cent increase respectively over the previous years.[21]

Table 2.5a: China: Grain Sown Areas: 1963-79 (1000 ha)

	Rice	Wheat	Soya	Tubers	Coarse*
1963	27715	23771	9633	11899	47721
1964	29607	25408	10009	11257	45823
1965	29825	24709	8593	11175	45326
1966	30529	23919	8425	11647	***46468***
1967	30436	25299	8503	10716	***44276***
1968	29894	24658	8363	10307	***42935***
1969	30432	25162	8329	10447	***43234***
1970	32358	25458	7985	10717	42858
1971	34918	25639	7791	10405	41459
1972	35143	26302	7583	10841	41340
1973	35090	26439	7408	11306	40915
1974	35512	27061	7261	11069	39763
1975	35729	27661	6999	10969	40904
1976	36217	28417	6691	10366	39049
1977	35526	28065	6845	11229	38737
1978	34421	29183	7144	11796	38231
1979	33873	29357	7247	10952	37835

Note: *Coarse grains includes corn, millets, sorghum and other minor grains. For 1966-69 (in italics & bold) estimated as the difference between total area under grain and that under rice, wheat, tubers and soybeans.

Source: USDA:ERS and *China Statistical Yearbook*, various years

21 Figures estimated from the USDA-ERS data sets on sideline production. This sub-sector is discussed in detail in Chapter 4.

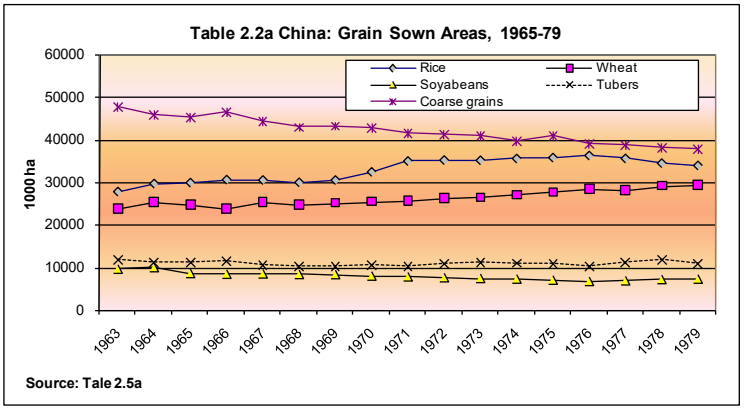


Table 2.5b: China: Annual Changes in Sown Areas of Various Grains, 1965-79

	Rice	Wheat	Soya	Tubers	Coarse
1965	218	-699	-1416	-82	-497
1966	704	-790	-168	472	1142
1967	-93	1380	78	-931	-2192
1968	-542	-641	-140	-409	-1341
1969	538	504	-34	140	299
1970	1926	296	-344	270	-376
1971	2560	181	-194	-312	-1399
1972	225	663	-208	436	-118
1973	-53	137	-175	465	-425
1974	422	622	-147	-237	-1152
1975	217	600	-262	-100	1141
1976	488	756	-308	-603	-1855
1977	-691	-352	154	863	-312
1978	-1105	1118	299	567	-506
1979	-548	174	103	-844	-396
1965-79 (average)	284	263	-184	-20	-533

Note: in 1000s of ha.

Source: Data derived from Table 2.5a

There are some discrepancies regarding changes in the area of land cultivated during the 1960's and the 1970's. As Perkins (1975) notes " …commune members did attempt to open up new land in marginal areas and by 1970 it was reported that some 12 million hectares had been added in this way representing about 11 percent of the total land area then under cultivation. Since 1970, efforts in this direction continued, but most of the activity appears to have been directed at improving existing land under cultivation, not opening up new land. For example, in late 1972 and 1973, some 3.33

million hectares were levelled and another 1.32 million hectares were terraced or otherwise improved, but no mention is made of a net expansion in acreage."[22]

Table 2.5c: China: Total Farm Areas Affected by Natural Disasters, 1963-79

	Total (Disaster Areas) (million ha)		
	Areas Covered	**Areas Affected**	**% AAf/AC**
1963	32.18	20.02	62.2
1964	21.64	12.64	58.4
1965	20.80	11.22	53.9
1966	24.21	9.76	40.3
1970	9.97	3.30	33.1
1971	31.05	7.45	24.0
1972	40.46	17.18	42.5
1973	36.49	7.62	20.9
1974	38.65	6.53	16.9
1975	35.38	10.24	28.9
1976	42.50	11.44	26.9
1977	52.02	15.16	29.1
1978	50.79	21.80	42.9
1979	39.37	15.12	38.4

Source: China Statistical Yearbook, 1993

Given the extreme effects of the weather factor, areas sown under various crops frequently varied from the area harvested. The latter variable is more appropriate to examine output and productivity than the former. Floods and drought occurring either simultaneously in different regions or occurring regularly in a particular region can reduce the potential area that can be sown or directly affect output in varying proportions, depending on the intensity of the weather factor. For this reason, data on harvested area is not easy to construct. Further problem in this regard relates to the duration of affliction of the weather factor and its timing. Consequently, in the regions where the annual agricultural cycle consists of more than one crop, evaluating the effects on potential annual output becomes more complex. However, some indicators of the weather factor have been officially made available based on well-defined criteria as regards area affected or covered by floods or droughts (This is discussed in greater detail in the next chapter).[23] From Tables 2.5c and 2.5d, it appears that areas of farmland affected by natural disasters were large during most of the latter half of the 1970s. For the period 1965-79, droughts affected a far greater share of the total areas covered than floods.

22 The addition of the reported 12 million hectares by 1970 that Perkins (1975) mentions is based on Zhou Enlai's interview to Edgar Snow that appeared in *The New Republic* (March 27, 1971: 2) and the next set of data is from *Peking Review* (January 4, 1974: 353, footnote 2 and 3 respectively).

23 For the most comprehensive study of the weather factor in Chinese agriculture See Kueh (1984)

According to Vermeer (1977), the average grain losses per hectare under severe weather varied from 100 kgs in 1950 to over 200 kgs in 1953. In 1964 floods and water logging affected a quarter of total area cultivated in 1964. While the 1950s were 'wet' in terms of disaster, the 1960s and the seventies were 'dry' when droughts became a serious threat to areas that grew dry land crops such as millets as well as areas where intensified agriculture, double cropping and change over to wet rice cultivation occurred, all of which required more water than before.[24]

Table 2.5d: China: Farm Areas Affected by Floods and Droughts, 1963-79

	Flood Affected (million ha)			Drought Affected (million ha)		
	AC	AAf	% AAf/AC	AC	AAf	% AAf/AC
1963	14.07	10.48	74.5	16.87	9.02	53.5
1964	14.93	10.04	67.2	4.22	1.42	33.6
1965	5.59	2.81	50.3	13.63	8.11	59.5
1966	2.51	0.95	37.8	20.02	8.11	40.5
1970	3.13	1.23	39.3	5.72	1.93	33.7
1971	3.99	1.48	37.1	25.05	5.32	21.2
1972	4.08	1.26	30.9	30.70	13.61	44.3
1973	6.24	2.58	41.3	27.20	3.93	14.4
1974	6.40	2.30	35.9	25.55	2.74	10.7
1975	6.82	3.47	50.9	24.83	5.32	21.4
1976	4.20	1.33	31.7	27.49	7.85	28.6
1977	9.10	4.99	54.8	29.85	7.01	23.5
1978	2.85	0.92	32.3	40.17	17.97	44.7
1979	6.76	2.87	42.5	24.65	9.32	37.8

Note: AC–Area covered; Aaf.–Area Affected

Source: *China Statistical Yearbook*, 1993

This however, does not indicate that efforts to prevent floods received more priority than to overcome droughts, though it can be argued that the enormous efforts towards water conservancy projects involving millions of people during this and the earlier periods was effective in dealing with floods and related disasters.(This issue is also taken up in the next chapter).

Growth in Agricultural Inputs

Inputs into agriculture can be either capital or intermediate in nature. Statistical data concerning areas sown to various crops discussed above provide only a partial picture of the status of the most fundamental of agricultural capital, namely

24 See Vermeer (1977: 26-27) for a discussion in this regard.

cultivable land. In the case of China, severe limits on the expansion of cultivable land makes sown area the relevant and appropriate indicator to evaluate changes in production. Shortage of land and a relatively large pool of 'surplus' labor resources presents technical conditions where labor plays the role of an intermediate input in direct production as well as the agent to expand cultivable land. Thus in China, within a collective framework it was possible to stretch the utilization of available farmland considerably by appropriately deploying labor towards capital construction that ultimately expanded TSA. Multiple cropping index (the proportion of sown area to cultivated area) on average, increased from 1.39 in 1963 to reach 1.51 by 1977, though it fell marginally to 1.47 in 1979-Table 2.5.e.

Table 2.5e: Cultivated Areas and Multiple Cropping Index (MCI), 1963-79 (1000 ha)

	Cultivated Area	MCI		Cultivated Area	MCI
1964	103312	1.39	**1972**	100614	1.47
1965	103594	1.38	**1973**	100212	1.48
1966	102958	1.43	**1974**	99912	1.50
1967	102564	1.41	**1975**	99708	1.50
1968	101553	1.38	**1976**	99388	1.50
1969	101460	1.39	**1977**	99247	1.51
1970	101134	1.42	**1978**	99389	1.49
1971	100699	1.45	**1979**	99498	1.47

Source: USDA;ERS

If uncertainties with regard to weather in various cycles of production played an important role, it was labour again that could minimize effects on production. In fact, historically, in Chinese agriculture, it was through and by labour, that creation, maintenance and expansion of agricultural capital and infrastructure were achieved. A difficult analytical problem arises especially with regard to productivity when the same labour is used for both creation and maintenance of all capital requirements in agriculture as well for production related activities during different agricultural cycles in the same accounting year.

Further, if part of the labour were to be deployed regularly, but in varying proportions over time, for maintenance of weather related risk-minimizing activities just in order to maintain a stable level of output, estimations of productivity are likely to be biased downwards.

Table 2.5f: China: Sown Areas of Non-grain Crops, 1963-79 (1000 ha)

	Non-grain Sown Area		Cotton	Oilcrops	Vegetables	Green Manure
	Total	Share in TSA (%)				
1963	19477	13.9	4409	4547	4295	3404
1964	21428	14.9	4935	5273	3840	3997
1965	23664	16.5	5003	5167		5512
1966	25841	17.6	4925			
1967	25713	17.7	5098			
1968	23670	16.9	4986			
1969	23340	16.6	4829			
1970	24220	16.9	4997	4522	2656	8413
1971	24838	17.0	4923	4791	2950	8489
1972	26710	18.1	4896	5297	2838	9293
1973	27391	18.4	4942	5325	3149	9695
1974	28569	19.1	5013	5324	3039	9897
1975	28661	19.1	4955	5652	3147	9921
1976	28590	19.1	4929	5783	3139	9605
1977	29704	19.8	4845	5639	3301	9419
1978	27890	18.8	4867	6222	3737	9138
1979	27116	18.5	4512	7051	3695	8493

Blank cells indicate data not available.

Source: USDA: ERS

A similar problem arises with regard to water in China's agricultural production (especially rice farming). Here, water does not merely take the form of a current input but is conditioned by a complex relationship with precipitation, conservation and management. For these reasons, labour as an input and the crucial activity of water conservancy and management is discussed separately in the next chapter. Discussing increases in labour input as a proximate factor in enhancing output, Perkins (1974) estimates that between the early 1960's and 1974, rural work force increased by 20 per cent and China was emerging as a country with the most densely populated farmland (high and increasing rural population per unit of land) even though, in 1969, measured by the ratio of population per unit of arable land, South Korea and Japan were more densely populated. Arable land per capita was 0.134 hectares in China compared to 0.073 and 0.055 in South Korea and Japan respectively.[25]

In the reminder of this section, trends in the irrigated area, in fertilizer use and in animal / mechanical / electrical power use during 1965-79 is taken up for a brief review. Fertilizer application increased at a rapid pace after 1964. Between 1958

25 Table 4, see Perkins (1975: 354).

and 1964 an average of 10 fertilizer plants per year were established. Compared to 1962 when domestic fertilizer production was 2.31 million metric tons, by 1965 it had more than trebled to reach a figure of 8.77 million metric tons (Table 2.6). Since 1965, an average of 100 small fertilizer plants were established mostly in the rural areas taking the number to 1100 by 1975, spread over all the provinces and about half of China's roughly 2700 counties. Though domestic chemical fertilizer production grew at a rate of 19 per cent per annum during 1962-80, imports grew at 25 per cent per annum till 1970 (Perkins and Yusuf, 1984). American delegations of 1975 and 1976 recorded the application of 50-225 tons of organic manure per cultivated hectare[26]. Perkins (1977) notes that levels of fertilizer application at 200 Kgs per hectare (organic manure and chemical fertilizer together) were among the highest in the world.[27]

Total chemical fertilizer use in gross terms–standard weight–in 1963 was a little below 4.5 million tons. The effective equivalent in terms of the content of nitrogen, phosphorus and potassium (the proportions of these in ammonium sulfate (20 per cent), super phosphate (18.7 per cent) and potassium sulfate (40 per cent) respectively, were only 23 per cent by weight at a little over 1 million tons. With the exception of 1968, the increase in application of modern chemical fertilizers over the entire period 1965-79 was consistently high. In 1979, the total standard and effective levels of application were 52.47 million tons and 10.68 million tons respectively.

Table 2.6: China: Fertilizer Production, 1963-79

	Total		Nitrogen	Phosphorus
	Standard	Effective	Effective	Effective
1963	3230	648	458	189
1964	5060	1008	675	332
1965	8766	1726	1037	688
1966	12220	2409	1461	946
1967	8290	1641	1015	622
1968	5580	1109	684	422
1969	8890	1749	1023	723
1970	12310	2435	1523	907
1971	15280	2994	1904	1078
1972	19164	3701	2444	1249
1973	24254	4592	2996	1589

26 Perkins (1977) reports on the American delegations to China in 1975 on a tour of rural industries. Another delegation in 1976 also reported the high level of fertilizer use (Johnson and Beemer Jr., 1977: 163).

27 The Japanese and South Korean levels were 380.1 and 304 kgs respectively in 1965 (Perkins and Yusuf, 1984:55).

	Total		Nitrogen	Phosphorus
	Standard	Effective	Effective	Effective
1974	22341	4222	2827	1390
1975	28504	5247	3709	1531
1976	28509	5244	3815	1418
1977	35807	7238	5509	1708
1978	42154	8693	7639	1033
1979	52159	10654	8821	1817

Note: Standard and effective conversion rates are ammonium sulfate (20 per cent nitrogen), super phosphate (18.7 per cent phosphorus), and potassium sulfate (40 per cent potassium). Effective weight measures the actual nutrient content.

Source: Data and notes USDA: ERS

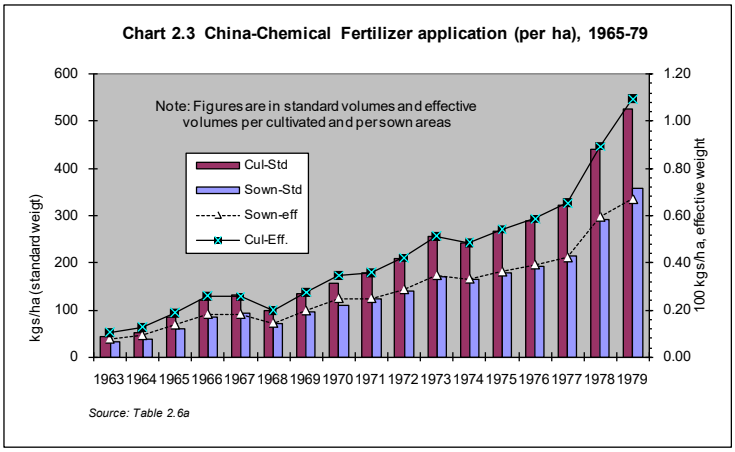
Chart 2.3 and Table 2.6a presents a better indicator of fertilizer use in terms of application per sown and cultivated areas. In the 1970s the growth in application per unit of land area of all types of chemical fertilizers in terms of effective weight was rapid–From a level of 8 kgs/ha of sown area in 1963, it increased to 29kgs/ha in 1972 and further to 67kgs/ha in 1979.

Table 2.6a: China: Chemical Fertilizer Application, 1963-79

	Total Chemical Fertilizer Application (1000 tons)		Average Application Per Hectare (kgs)			
			Cultivated Area *		Sown Area	
	Standard	Effective	Standard	Effective	Standard	Effective
1963	4483	1043	44	10	32	8
1964	5363	1290	52	12	38	9
1965	8812	1942	85	19	62	14
1966	12582	2655	122	26	86	18
1967	13128	2661	133	26	94	18
1968	10129	1995	100	20	73	14
1969	13611	2731	134	27	96	20
1970	15811	3512	157	35	110	25
1971	18142	3647	180	36	125	25
1972	20931	4207	208	42	141	29
1973	25553	5111	255	51	172	35
1974	24051	4858	241	48	164	33
1975	26579	5369	266	54	178	36
1976	28850	5828	290	59	194	39
1977	31920	6480	322	65	214	42
1978	43681	8840	440	89	291	59
1979	52476	10863	527	110	357	67

Notes: Standard weight is gross weight converted standard fertilizer weight, Fertilizer application (use) data for 1965 and earlier are sales volume. *Figures are effective for 1958-59, 1961-64, 1966-69, and 1971-74.

Source: Data and notes from USDA: ERS



The more important component of fertilizer application in Chinese agriculture for this period, however, was natural manure and night soil. Though a precise figure for the amount of nitrogen that these two sources provided is difficult to estimate, Perkins suggests that Hogs alone could have supplied about 10 kgs per hectare in the mid-1950's rising to about 25 kgs by the early 1970s.

With human population increasing by about 35 per cent in this period, night soil along with manure from draught animals together could have provided an additional 30 kgs per hectare in the early 1970's. The impact of the additional 70 odd kgs of nutrient on overall output of grain and also cotton would have definitely been significant.[28] There was further soil quality enhancement by application of green manure. Though the production figures for green manure are not available, the area sown to this crop was significant–3.4 million ha (17 per cent of non-grain sown area) in 1963, 5.5 million in 1965 and over 9 million ha (over 30 per cent on non-grain sown area) in 1978. From 1965, this area exceeded the sown areas under cotton, oil crops and vegetables and by 1978 it was double the area under cotton–Table 2.5f.

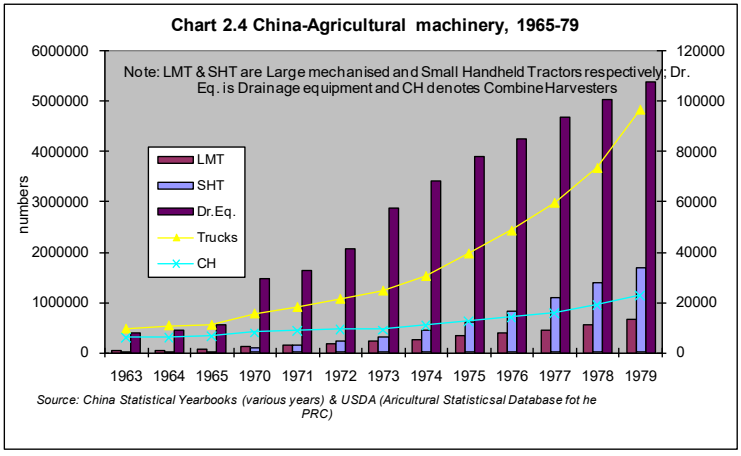
However, there are obvious limitations to grain output increases with increased application of fertilizers. Between 1963 and 1974, a 15.1 million gross ton increase in fertilizer use was associated with a 57 million ton rise in grain production where as between 1970 and 1974 a further 9 million ton increase was matched by only a 19 million ton increase in grain output. A detailed examination of trends in output of both grain and non-grain crops is essential to draw clear conclusions which is taken up for discussion in Chapter 4.

28 Perkins (1975: 355-6) discuses in detail the significance of this crucial input in contributing to grain output increases.

Mechanization

As regards mechanization and use of agricultural machinery during 1965-79, the performance was equally if not more impressive than the case of fertilizer use. Statistical data on five types of modern machinery are available-Chart 2.4. Besides large and medium scale tractors, combined harvesters and trucks (to transport both inputs and agricultural produce) that together symbolize modern mechanized agriculture, the two other categories, namely drainage equipment and small hand-held tractors signify differently the priorities with regard to mechanization.

Two particular characteristics of rice cultivation discussed in the previous chapter were first, water management–both provision of adequate water as well as draining water at appropriate times alternately within a crop cycle and across the annual crop rotation–and secondly small plot sizes that would alone effectively enable water control even in a single crop cycle (sub-annual) where crops require simultaneously varying amounts of moisture over their production cycle.



The largest increase in agricultural machinery during 1963-79 was in the category of drainage equipment-from around 0.4 million units to over 5 million by 1978. As for hand-held tractors that were appropriately designed to cater to small plots of land particularly terraced fields and paddy fields in general, the increase was from a mere 992 to over 1.67 million units (a thousand six hundred and eighty four-fold increase).

The additions to other agricultural equipments over the period were an 11 and 10 fold increase respectively in the number of large and medium scale tractors and trucks for agricultural use. Electrical and mechanical power available for irrigation

and drainage was 8.5 million hp in 1965 increasing more than three-fold to 30 million hp by 1973.

Table 2.7: China: Indicators of Agricultural Modernization, 1952-79

	TPA	Total IA		% PIA to	Small RHPS	Rural EC	
	10000 hec.	10000 hec.	PIA	Total IA	Nos.	10000kw	Bill. kwh
1952	136	1995.9	31.7	1.6	98	0.8	0.1
1957	2636	2733.9	120.2	4.4	544	2.0	0.1
1962	8284	3054.5	606.5	19.9	7436	25.2	1.6
1965	15579	3305.5	809.3	24.5			3.7
1978	40670	4496.5	2489.5	55.4	82387	228.4	25.3
1979	42219	4500.3	2532.1	56.3	83224	276.3	28.3

Note: Tractor ploughed area (TPA), Irrigated area(IA) Power Irrigated Area (PIA) Rural Hydroelectric power stations(RHPS) & Electricity Consumption(EC).

Source: China Statistical Yearbook, 1993

The direct consequence of such high levels of mechanization and degree of modernization, is reflected in the expansion of irrigated area (including power irrigated area) and mechanically ploughed areas that rose from over 33 million ha and 8 million ha in1965 to 45 million ha and 25 million ha respectively by 1979. Thus, by 1979, of the total cultivated area, 45 per cent was under irrigation, of which more than half (25 per cent of total) was power irrigated while tractors ploughed over 42 per cent. Ishikawa (1981) notes that double cropping became feasible from the mid-1960s in central China due to the introduction of mechanical pumps. This failed in 1956 when quicker-ripening rice varieties were disseminated and efforts were made to double crop rice over 2.3 million ha. Due to labor shortages during the peak demand periods of transplantation, harvesting and the operations between two crops could not be accomplished.[29]

According to Perkins (1975) mechanization of certain labor intensive operations may not alone account for the expansion of output during 1963-70. Improvements in water management/irrigation were also crucial.A detailed discussion of water conservancy activities involving massive mobilization of seasonal labor is taken up in Chapter 3.[30]

There were considerable differences within the Chinese leadership on the issue of agricultural mechanization and until the mid-1960s mechanization proceeded

29 Ishikawa (1981: 52 and 107)

30 This raises the question-was the yield response falling as regards fertilizers or are there other reasons to explain this observation?

rather slowly[31]. However, seasonal labor shortages, resulting from increases in multiple cropping which required intensive effort in harvesting, field preparation and planting during the switch over period from one crop to the next, provided some scope for mechanization. A ten-year plan for agricultural mechanization launched in 1959 with a target of complete mechanization, achieved only 10 per cent due to the economic crisis that followed the Great Leap Forward period. It was only after the adoption of the policy of "speeding up farm mechanization" at the 1970 agricultural conference in North China that farm machinery production as well as the number of work stations for servicing them accelerated at a rapid pace.

But modernization of agricultural capital did not mean a complete break with traditional means of production. Data on draught animals during the period–Table 2.7a–does not show any reduction in their inventories; in fact there is an increase in all categories of large draught animals. The well-organized system of collection of night-soil and animal waste (animal husbandry sector including draught animals) as well as cultivation of green manure, due to its labor-intensive nature, enabled greater labor absorption. The application of traditional organic fertilizers replenished soil fertility, thereby also preventing the negative effects arising from high levels of chemical fertilizer application. Besides this, Stavis (1978) reports that a mixture of chemical fertilizer and compost in the form of "mud balls" applied near the root zones of rice reduced fertilizer requirements by 50 per cent.[32] Organic fertilizer use however continued to rise even after chemical fertilizer production had begun to expand rapidly-from 729 million tons in 1952, organic manure use increased to 2072 million tons in 1979.

Table 2.7a: China: Large Animal Inventory, 1963-79, (year-end, 1000 head)

Year	Total *	Drt. Animals	Cattle**	Horses	Donkeys	Mules	Camels
1963	75050	40330	59680	6865	6746	1355	402
1964	79430	41520	63158	7394	7048	1403	425
1965	84210	43220	66951	7921	7438	1447	448
1966	87400						
1967	89820						
1968	91790						
1969	92280						

31 Stavis (1978a) has reviewed the political aspects of these debates within the Chinese Communist party.

32 Stavis 1978: 639

Year	Total *	Drt. Animals	Cattle**	Horses	Donkeys	Mules	Camels
1970	94360	49350	73583	9648	8400	2245	487
1971	95370	49900	73986	9926	8513	2444	505
1972	95760	51450	73866	10341	8353	2682	515
1973	97180	51400	74676	10730	8350	2923	500
1974	97530	51910	74554	11103	8233	3139	504
1975	96860	51220	73547	11299	8127	3354	535
1976	94980	50420	71693	11438	7766	3536	545
1977	93750	49790	70398	11447	7630	3715	564
1978	93892	50230	70724	11245	7481	3868	574
1979	94591	50290	71346	11145	7473	4023	604

Note: Drt. Animals refers to draught animals used in many farming and transport activities

*Total is the sum of cattle, horses, donkeys, mules, and camels. ** Includes yellow cattle, water buffalo, yaks, and dairy cattle (local and hybrid breeds).

Source: USDA: ERS

A final indicator of the modernization of production conditions was rural electrification. Mostly based on a small scale and combined with the purpose of water conservancy, electricity consumed in rural areas was of the order of over 28 billion Kwh in 1979 compared to a mere 3.7 billion Kwh in 1965. The corresponding numbers of rural hydroelectric power stations in the two years respectively were 83,224 and 98.

Agricultural Output and Sideline Production

We now turn to trends in agricultural output during 1965-79. Over the period, output of all categories of food grains show a gradual rise with relatively less intense fluctuations that characterised the period 1958-63. As Table 2.8 shows except for soya beans output that declined by 0.43 per cent p.a. (and also suffered a reduction of area sown; Table 2.5b)-the other food grains grew at a cumulative annual rate of over 3 per cent p.a.

In terms of annual change in production, total food grains output annually increased by over 10 million tons on average between 1964 and 1979. Output of rice and wheat expanded at an annual average rate of 4.3 million tons and 2.7 million tons respectively–Table 2.8a.

Table 2.8: China: Trend Growth Rates of Various Agricultural Products, 1952-79, (%p.a.)

	1952-79	1965-79		1952-79	1965-79
Grain	2.52	3.32	Sesame	-1.53	-0.71
Rice	2.82	3.37	Sugar Cane	3.88	4.34
Wheat	3.60	5.83	Beetroot	4.66	1.30
Corn	3.96	8.64	Fruit	2.67	6.53
Soybean	-0.95	-0.43	Grain(-)	3.17	6.03
Tubers	3.06	3.01	Grain(+)	2.96	5.75
Oil-crops	0.19	5.51	Millet	-1.70	1.67
Cotton	2.89	-0.23	Sorghum	0.17	4.61
Peanuts	-0.26	0.41	Tea	3.62	7.95
Rapeseed	2.48	4.30			

Grain (+)/(-) refers to inclusion/exclusion of tubers and soybeans

Source: China Statistical Yearbook, various years & USDA, ERS

The 1974 grain-output figure of 74 million tons–40 per cent over the 1957 figure–was an achievement that requires closer examination in order to identify the factors that made it possible. Capital construction in agriculture in the form of water control infrastructure reflected in the large expansion of irrigated acreage was complemented by increases in other inputs such as chemical fertilizer, land improvement and adoption of high-yielding varieties of seed. These together provide support to the usual hypothesis concerning the dynamics of rice production (discussed in chapter 1). A detailed discussion of food production and availability as well as the diversification of diet that includes an increase in consumption of animal products (entailing indirect consumption of corn and tubers in the form of feed) is taken up in chapter 4. The remainder of this section will focus on the gradual emergence of 'sideline' industry as an important component of the rural economy.

Table 2.8a: China: Annual Changes in Output of Various Grain Crops, 1964-79

(1000 Tons)	Grain^	Rice	Wheat	Corn	Soy	Tubers
1964	21778	9235	2365	2110	960	3018
1965	7025	4720	4380	970	-1730	-270
1966	19475	7670	60		2130	2670
1967	3820	-1705	3205		0	-100
1968	-8765	845	-1030		-230	-140
1969	1915	535	-170		-410	1830
1970	28985	14925	1900		1080	2560
1971	10185	5215	3390	2820	-100	-1610

1972	-9660	-1850	3410	-3750	-2160	-550
1973	24455	8380	-760	6530	1920	7040
1974	10335	2170	5640	4290	-900	-3320
1975	9245	1655	4445	4300	-230	330
1976	1790	250	5075	940	-600	-1910
1977	-3580	2755	-9310	1230	620	3010
1978	22040	8365	12765	6555	305	2070
1979	27350	6820	8890	4090	-105	-3280
Average Annual Change	10400	4374	2766	*3001	34	709

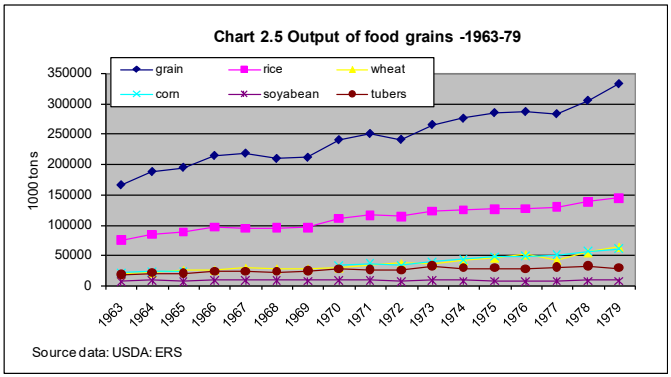
Note: Grain^ refers to the sum of rice, wheat, corn, soy and tubers. Tubers are converted at a standard rate of 5.1 for the entire period. * The average annual change in output for corn is for 1971-79.
Source: USDA: ERS

Table 2.8b: China: Expansion in Farm Output, 1949-79 (% changes)

	1949-65	**1952-65**	**1965-79**
Rice	56	22	44
Wheat	58	39	110
Corn	n.a	12	97
Soybean	17	-13	44
Tubers	27	-6	45
Cotton	109	75	18
Peanuts	3	-19	30
Rapeseed	21	18	45
Sesame	-4	-16	27
Jute/Hemp	91	26	23
Sugar cane	57	-2	10
Beetroot	-3	-15	139
Tobacco	64	-4	38

Note: Figures are percentage changes (using end point figures.
Source: Calculated from *China Statistical Yearbook*, 1993

An important component of the institutional reorganization of 1962 was the removal of restrictions on private plots. Until 1967, a small portion–not exceeding 5 per cent-of land was allowed for private use. This was intended to supplement household income as well as consumption. These plots normally took the form of homestead gardens to grow vegetable or other supplementary food or raise small animals. In 1971, some crafts–wood-work, pottery etc–were also permitted as sideline activity. These private plots besides significantly expanding household income and consumption, also contributed to the expansion of the animal husbandry sector as a whole.



Tables 2.9a and 2.9b, respectively provide inventory data of small animals-hogs, sheep and goats for the period 1963-79. Except for the years 1968 and 1969, there were consistent increases in both inventories and numbers slaughtered.

Table 2.9a: China Small Animal Inventory, 1963-79 (1000 head)

	Hogs	Goat	Sheep	Total (G+S)
1963	131800	67730	69740	137470
1964	152470	62240	74450	136690
1965	166930	60770	78260	139030
1966	193360			138080
1967	190060			144330
1968	178630			144210
1969	172510			140210
1970	206100	61410	85630	147040
1971	250350	62780	87330	150110
1972	263680	61340	87980	149320
1973	257940	64100	93180	157280
1974	260780	66170	94700	160870
1975	281170	68040	95330	163370
1976	287250	65460	92710	158170
1977	291780	67830	93530	161360
1978	301285	73540	96397	169940
1979	319705	80574	102568	183142

Source: USDA: ERS

The average annual additions to the number of hogs slaughtered for 1964-79 was over 6.8 million (heads) even though the slaughter rate declined from a high of almost 80 per cent in 1965 to 55 per cent in 1978. In the case of sheep and goats together, over 2.8 million animals were annually added to the inventory between 1964 and 1979. Data on slaughter figures are not available except for 1978 and 1979 when the rates were respectively 16 per cent and 20 per cent. The significance of the growth of

the animal husbandry sector (to include the broad range of non-farm or non-vegetal food production) in enhancing nutritional levels are discussed in the next chapter.

Table 2.9b: China: Slaughter Rates for Hogs, Goats and Seep, 1963-79, 1000s

	Total Slaughter		Slaughter Rates (%)	
	Hogs	Total (G+S)	Hogs	Total (G+S)
1963	78000			
1964	105000		78.0	
1965	121670		79.7	
1966	131870		79.8	
1967	133780		79.0	
1968	131140		69.2	
1969	126200		69.0	
1970	125930		70.6	
1971	147980		73.0	
1972	165980		71.8	
1973	166840		66.3	
1974	162440		63.3	
1975	162300		63.0	
1976	166500		62.0	
1977	167870		59.0	
1978	161095	26217	58.0	16.2
1979	187675	35434	55.0	19.3

Note: Slaughter rates are numbers slaughtered proportionate to inventory in the beginning of the year.

Source: USDA: ERS

The discussion so far in this section on agricultural growth during 1965-79, provided a quantitative picture by compiling statistical information on conventional categories of inputs and outputs. It is generally assumed that the essence of economic growth is reducible to a few numerical data. But economic growth as a quantitative representation of expanding processes forms only part of an understanding of the wider phenomena of economic development. In the Chinese experience until the late 1970s, there were some features that demonstrate a unique approach to development. These include the system of agricultural research and extension that ensured an appropriate adaptation of modern technology to local conditions and needs, labour mobilization particularly in the areas of water conservancy and irrigation, and finally the strategy of rural industrialization. These are taken up for discussion in the next chapter.

3. Characteristics of Agrarian Change and Rural Transformation, 1965-79

INTRODUCTION

This chapter takes further the discussion on some aspects of the technological transformation of Chinese agriculture, touched upon in the previous chapter. One of the defining characteristics of agrarian transformation in China was overcoming the shortage of agricultural and rural capital by the mobilization of vast reserves of under-employed rural labour to construct water conservancy and irrigation infrastructure besides enlarging transport networks[1]. A broader theoretical issue for developing countries in their initial stage of industrialization concerns 'primary accumulation' that involves mobilization of resources to establish an industrial base, primarily for the production of capital goods and sustain the process of industrialization. In most countries, these resources are either obtained from external agencies and/ or extracted in the form of surplus from the agricultural sector via changes in the terms of trade i.e. by the manipulation of prices of agricultural produce or of those inputs that are supplied to agriculture by industry or both. The net effect of such changes is an outflow of resources from agriculture. In section 3.1 below, the Chinese experience in this regard is examined by surveying some of the theoretical issues in the literature along with empirical evidence.

The role of rural labour mobilization in enlarging agricultural infrastructure primarily in the realm of water conservancy–'labour accumulation'-is discussed in section 3.2. This is followed by an examination of the progress in irrigation. In section 3.4, technological transformation and modernization of agriculture since the mid-1960s is elaborated. Section 3.5 is an exploration of industrialization in rural China in the 1960s and the 1970s, which was essentially adapted from the strategy previously attempted during the mid to late 1950s and which was unique in comparison to other developing countries. The final section concludes this chapter with some remarks on the transformation in agriculture and rural economy over the period 1965-78.

1 Besides mobilization of rural labour, both rural and urban labour participated in construction repair and maintenance of roads, bridges and industrial infrastructure during lean agricultural periods (these were known as "winter works programs").

INTER-SECTORAL TERMS OF TRADE, PRIMITIVE SOCIALIST ACCUMULATION, AND INDUSTRIALIZATION

A fundamental requirement for a traditional economy to launch the process of modern economic development-identified with industrialisation–is the generation of initial resources to establish an industrial capital goods producing sector. This is normally accomplished by the extraction of 'surplus' from the traditional sector–in most cases the agricultural sector. Thus, in development theory, a central issue concerns the role of agriculture in providing resources-primary accumulation-during the initial phase of industrialisation.

It has been argued by some scholars that inter-sectoral resource flows in China closely resembled the Soviet case, where the structure of prices-maintaining lower prices for agricultural products and higher prices for industrial goods-enabled surplus extraction for industrialisation funds (Lardy, 1983; Sheng, 1993, 1993a; Lippit, 1974, Riskin, 1987). Two clarifications are however necessary in this regard. One relates to the issue of primary accumulation and the other to changes over time in the shifting of the terms of trade between agriculture and industry.

As regards estimating changes in the terms of trade between agriculture and industry two methods have been used. One is the 'socialist analytical tool' namely "the scissors-gap" and the other, more widely used, the changes in the ratio of agricultural to industrial prices. We take up the latter first.

The official indices of prices of farm products (purchasing or procurement prices) and those of industrial products sold in rural areas for the period 1952 to 1978 are shown in Table 3.1 (with 1951 as the base year). The growth rates of these two price indices (using OLS estimates) show that while the rate of growth of procurement prices of agricultural and sideline products during 1951-78 was 2.09 per cent, that of the price index of industrial products sold in rural areas was almost nil (-0.07 per cent p.a.). It can be inferred that the rate of price increases of agricultural products exceeded considerably that of industrial products and therefore, the terms of trade moved favourably towards agriculture during 1951-78.

As for the other method-"the scissors-gap" or "scissors-difference"-it is also based on prices of agricultural and industrial products[2]. The scissors gap or difference measures the degree of discrimination against agriculture. A zero percentage gap relative to the gap in the base year implies that prices of agricultural and industrial goods are in parity and that agriculture is not discriminated against. According to a Chinese study quoted by Yao (1994: 138) this gap was modest during the early 1950s

2 Price scissors is therefore, the barter terms of trade between the peasantry and the state sector.

but grew gradually until 1978. The difference between the prices of industrial goods higher than the "actual market value" and that of agricultural goods lower than their actual market value" grew from 10 per cent in the early 1950s to nearly 27 per cent by 1978[3]. Yao also estimates the extent of indirect capital transfers from agriculture to non-agriculture during 1953-78. In these 26 years, the transfers are estimated to have been nearly Yuan 200 billion[4].

Table 3.1. Changes in Overall Price Indexes (1951-92)

year	RPI	RCLI	FSPI	PRPI	APPI		year	RPI	RCLI	FSPI	PRPI	APPI
1951	100	100	100	100	100		1966	100	100	100	100	100
1952	111.8	115.5	121.6	109.7	90.2		1967	133.2	136.4	195.5	114.1	58.4
1953	115.6	121.4	132.5	108.2	81.7		1968	133.3	136.5	195.2	113.8	58.3
1954	118.3	123.1	136.7	110.3	80.7		1969	131.8	137.8	194.9	112.1	57.5
1955	119.5	123.5	135.1	111.9	82.8		1970	131.5	137.8	195.1	111.9	57.4
1956	119.5	123.4	139.2	110.8	79.6		1971	130.5	137.7	198.3	110.2	55.6
1957	121.3	126.6	146.2	112.1	76.7		1972	130.2	137.9	201.1	109.6	54.5
1958	121.6	125.2	149.4	111.4	74.6		1973	131.0	138.0	202.8	109.6	54.0
1959	122.7	125.6	152.1	112.4	73.9		1974	131.7	138.9	204.5	109.6	53.6
1960	126.5	128.8	157.4	115.5	73.4		1975	131.9	139.5	208.7	109.6	52.5
1961	147.0	149.6	201.4	121.2	60.2		1976	132.3	139.9	209.7	109.7	52.3
1962	152.6	155.3	200.1	126.6	63.3		1977	135.0	143.7	209.2	109.8	52.5
1963	143.6	156.1	194.4	125.3	64.5		1978	135.9	144.7	217.4	109.8	50.5
1964	138.3	140.7	189.5	122.9	64.9		1979	138.6	147.7	265.5	109.9	41.4
1965	134.6	139.0	187.9	118.4	63.0		1980	146.9	158.5	284.4	110.8	39.0

RPI = retail price index, RCLI = Residents' cost of living index FSPI= Farm & sideline products purchasing price index
PRPI= Industrial. products rural retail price index, APPI= industrial & Agricultural products price parity index (PRPI/FSPI)
Source: State Statistical Yearbook (1993) Table 7.2.

Thus it would be incorrect to conclude from the favourable terms of trade for agriculture or modest gaps in the scissors difference using these price indices, whether there was a net inflow/outflow of resources from the pricing policies. The mere movement of prices is inadequate to estimate the net flow of resources across sectors.

3 This seems to be a mis-translation from the Chinese text. The term "actual market values" should appropriately read "actual production values".

4 In the early 1950s and 1960s these transfers made up more than 2/3rds of total state budgetary incomes. The figure for 1978-85 does not take into account the reverse flow of resources as input and infrastructural subsidies and expenditure on rural social services which amounted to a total of Y224.9 billion which gives a net transfer of Y176.8 billion-or roughly 20 per cent of the total state budgetary revenue (Yao: 139). Also the figures do not include tax payments by rural enterprises which as a proportion of total state tax revenue increased from 4.2 per cent in 1978 to 13.4 per cent in 1989 (Yao: 86, 140)

With regard to China-and this applies as well to any other developing country with a 'backward' agriculture-Ishikawa (1967, 1967a) argued that if conditions in the agricultural sector were so backward that it required resources for its own development and growth, it would be unable to generate the required surplus resources towards accumulation for industrial capital. This however, raises the counter question: where would the funds then come from, if not agriculture? The argument becomes circular. For the period 1952-57, using the trade surplus approach, Ishikawa concluded that there was a positive net flow of resources out of agriculture only during 1952-54 at current prices and at constant prices this was true only for the accounting year 1952-53. In other words, except during the initial year (or two years at current prices) during the period in question there was a net flow of resources into agriculture. Thus, the movement of terms of trade in favour of agriculture and net flow of resources into agriculture are consistent.

Nakagane (1989) extended Ishikawa's approach by estimating also the savings surplus (or deficit) in Chinese agriculture for the period 1952-85 and concluded that:

1. the "popular view stressing the lopsided squeeze on agriculture in the form of farm surplus to provide for industrialisation funds" does not hold true [5] and

2. that the agricultural sector suffered a shortage of savings from the early 1960s till the reforms of the late 1970s and further, savings of the non-agricultural sector generally made up a larger share of total accumulation funds (and even exceeded it in some years).

The final hypothesis is that industrialisation funds were largely provided for by the non-agricultural sector itself, via low and stagnant real wages thereby low consumption and consequently high rate of savings. However, cheaper agricultural products supported the low real wages. In the 1960s and 1970s therefore, there was a net flow of resources into agriculture.

Sheng (1993, 1993a) reached an opposite conclusion. He took into consideration transfers through price as well as non-price mechanisms (budgetary transfers) and examined inter-sectoral resource flows between agriculture and industry for the period 1952-88. The empirical results show that for the entire period in question, at current prices, agricultural savings surplus was small, relative to agricultural investment. In other words, in terms of commodity exchange and financial transfers (the non-price components), there was a net flow from the non-agricultural sector

5 (pp. 168) Nakagane however concedes that the extent and amount of trade and saving surpluses in Agriculture varies depending up on the definition of agriculture and non-agricultural sectors. Rural industry in this analysis is considered part of the latter.

to agriculture. But, through the price mechanism-by under-pricing agricultural products and overpricing industrial goods-the net flow out of agriculture into non-agriculture more than offset the former[6].

Sheng's overall hypothesis fills the missing gap in Nakagane's work. In the latter, low real wages in the non-agricultural sector was supported by low prices of agricultural products. Sheng adds that along with this, agricultural residents' per capita consumption of industrial goods as well as of agricultural products in financial as well as physical terms was much lower than that in the non-agricultural sector. It must however be added, that inter-regional sectoral flows particularly within agriculture from productive regions to less productive ones, could have been actualised through the budgetary flows over the period.

Saith (1985) examines theoretical questions with regard to the necessary conditions-both historical and contemporary–for socialist industrialisation and the position of the agricultural sector (the peasantry) in developing countries by comparing their experience with that of Russia (the former Soviet Union)[7]. Accordingly, the position of the agricultural sector in the socialist transition of a poor country is such as to serve as a source of investible resources for industrialisation and at the same time form the subject of socialist development as it accounts for the bulk of the population especially the poor and oppressed component[8].

6 According to Sheng's estimates during 1986-, the difference between the flows was very small. In this analysis, non-agriculture activities in the rural sector are not included in agriculture while state farms are.

7 For a theoretical treatment of primitive accumulation from a Marxist perspective see the 'Introduction' in Patnaik (2007).

8 Saith (1985: 2-3). Saith elaborates on two issues: (1) The indispensability of industrialization for economic development, which is the vantage point from which the entire transformative process is viewed (2) An increased burden of industrialization in contemporary developing countries compared to earlier industrialisers. As he notes "…accelerated industrial growth generates inter-sectoral imbalances which are resolved by the adoption of expeditious institutional policies, especially in the rural sector, which can easily divert the trajectory of societal transformation away from its socialist direction" (p3).

As regards the second issue, the increased burden arises owing to initial conditions in terms of low levels of primary food availability, small share of industrial capacity, institutional weaknesses both in the broader sense of organizational and administrative capacities, low levels of development of banking and trade institutions as well as infrastructure in transport and communications etc. Historical timing encapsulates changed international/global conditions with regard to trade and capital flows.

The technological dimension in production, viz, higher capital output as well as capital-labour ratios places greater demand on skills and manpower requirements and the educational infrastructure that provides for the same. Besides of course, higher population growth in developing countries intensifies the challenge of industrialization considerably.

Given the initial conditions in China (as was and is the case in several developing countries) namely the predominance of agriculture in its share of total output and employment with much higher population growth than during the initial phase of industrialisation of the presently industrialised countries, the demands on the agricultural sector, of rapid industrialisation and simultaneous rural development assumed a potentially demanding situation. Saith argues that when the entire agricultural sector is socialised, Primitive Socialist Accumulation or PSA as a concept becomes non-applicable, and, the net inter-sectoral flow of resources does not have any distributional implications in terms of unequal exchange since in both sectors the same socialist rules of distribution apply (same class).

Further, methodological problems as well as limitations of conceptual clarity restrict the interpretative significance of empirical estimates of inter sectoral flows and therefore provide only a rough indication of the direction of those flows. Ishikawa's study of the Chinese case reveals in its own terms, that agriculture did provide net resources for industrialisation, even though this may have declined over time or constituted only a small proportion of total industrial investment requirements. The statistical evidence on these flows discussed above may be understated for the following reasons amongst others:

1. The base year prices used to estimate inter-sectoral net resource flows–(ISNRF) are subject to bias. Also, transfer-pricing methods to enforce unequal exchange adds another level of complexity to the estimations of prices and their changes over time. Further in the case of agricultural exports, profits from international trade accrue to the state directly, while internal prices are pegged low.

2. In the case of Japan, its colonial entities, Korea and Taiwan provided most of the agricultural surplus required for industrialisation and this would not show up in the accounts of ISNRF.

3. Problem of levels of aggregation–what might reveal as an overall balance in terms of ISNRF, might actually be net outflows or inflows in various sub-sectors (state farms versus other farming entities).

Perhaps more important than the issue of net flows of resources from agriculture to other sectors or the other way around during different phases between 1950 and 1978, is whether collective agriculture was capable of generating more resources or surplus than a system that is grounded on an unequal private ownership of land. This is briefly discussed in the following section.

Under-employed Labour and Potential Economic Surplus

The economic surplus (or conceptually the actual economic surplus) that was realised immediately following collectivisation in the early 1950s was substantial, as discussed in chapter two (section 2.1b). Besides this, collectivization offered an additional source of surplus that could be tapped for the purpose of capital formation by utilising labour time that was available in excess of that required to maintain the existing level of output. Thus, the potential economic surplus that can be realised would be possible only by the mobilisation and deployment of under-employed and unemployed labour towards productive activities[9]. Schran (1959, p.75) estimated the average annual labour days worked in China's agriculture to have been only 119 in 1950 which implies at least 246 idle labour days, a higher order of underemployment than in India where the Rural Labour Enquiry in the mid-1950s estimated 120 idle labour days annually.

Buck (1937) estimated the average annual male labour surplus during the 1930s to be about 1.9 months of idle time or roughly 15 per cent of labour time for the total male labour force with 80 per cent of it during the winter months from November to February. This average would imply a significantly higher level for northern and parts of central China where the agricultural cycle is shorter. Mao's own estimate for the early 1950s was of the order of a third of the labour force[10]; "Under present conditions of production there is already a surplus of roughly one-third of labour power. What required three people in the past can be done by two after cooperative transformation, an indication of the superiority of socialism. Where can an outlet be found for this surplus labour-power one third or more? For the most part, still in the countryside..."[11]This potentially available additional labour time however, cannot be mobilised under a system that predominantly consists of small farm holdings, as labour mobility is considerably restricted. Under a cooperative or collective organisational framework, pooling of under-employed labour in the slack season for investment projects is possible but under certain conditions. The primary condition would be in the form of some benefits that accrues as remuneration either immediately in the form of the equivalent of wages for additional work or later in the form of raising production, with the additional income being realised at the end of the period of usually more than a year. In the case of investment projects that take a considerably longer period of time to be completed, the benefits would correspondingly be available long after the investment of labour time.

9 The original formulation of the concept of potential economic surplus was made by Baran (1957). It included four components–excess consumption, unproductive workers, irrational and wasteful organizational production apparatus and output foregone owing to unemployment.

10 The substantive part of the discussion in this section is drawn from Patnaik (1998).

11 Mao, Zedong, 1954 (*Selected Works* vol. 5: 269). Quoted in Patnaik (1998).

As Patnaik (1998a) argues, "It is possible to implement such a system of more work without immediate additional payment, or what would be called a system of 'deferred wages' under capitalism, only with an egalitarian policy of providing for everyone's basic needs while they work harder, and in a structure of ownership which ensures that the assets created by the extra work belong by an large to the people putting in the extra work. It would be virtually impossible to motivate people to work harder than they are initially doing, no matter how underemployed they might be, unless the initial low incomes are equitably shared in order to ensure subsistence for all, and unless the fruits of their extra work belong to them and benefit them in the long run. This is the economic and social essence of the egalitarian strategy"[12].

Table 3.2a: China: Labour input in Agriculture, 1950-59 (billions of labour days)

Year	Average	Total Annual
1950	119	26.489
1951	119	26.835
1952	119	27.168
1953	119	27.537
1954	119.3	28.155
1955	121	29.439
1956	149	38.084
1957	159.5	41.518
1958	174.6	47.474
1959	189	58.42

Note: The sharp increases from the large-scale mobilisation for rural water conservancy in the winter of 1955-56 and 1957-58 are reflected above. The estimates cited for 1959 appear somewhat improbable as de-mobilisation was seen throughout the year.

Source: Peter Schran, The Development of Chinese Agriculture 1950-1959, p.75.

During 1950-58, in the agricultural sector alone, average annual number of labour days worked rose from about 119 days in the early 1950s to almost 150 days in 1956 and further to 189 days in 1959 (Table 3.2a). Correspondingly, the total annual labour input in agriculture that was 26.5 billion labour days in 1950, expanded to over 38 billion labour days and further to 58 billion labour days–almost double the level in 1950.

There was a wide range of projects for which labour was mobilised from the mid-1950s until 1958 and again from the mid-1960s until the late-1980s, that included

12 See Patnaik (1998a: 242), in Nayyar (ed.) (1998).

land reclamation, improvement of land, forestry, transport and communications infrastructure besides others, but the most important amongst these was in the area of irrigation and water conservancy. The following section takes up this issue in greater detail.

Labour Mobilization and Farmland and Water Conservancy

Irrigation or broadly water-management, has been crucial to Chinese agriculture for centuries-prompting the occidental description of China as an agro-hydraulic society.[13] Historically, the maintenance and management of water resources was a collective effort and institutions to accomplish this were well developed. Given the limitations to land augmentation, combined with the uncertainties associated with regular climactic disturbances in the form of floods and drought, it was inevitable that newer means would be devised to ensure that the potential produce using available resources was least affected.[14] The need for water control is not merely restricted to prevention of losses due to flood or drought. In order that modern inputs effectively translate into higher productivity, irrigation infrastructure emerges as one of the fundamental conditions. It is well documented (as seen in Chapter one) that wet-rice cultivation as an advanced system, requires careful water management.

Beginning in the 1950s and continuing until even the mid-1990s, unprecedented numbers of peasants were mobilised during the winter seasons for the construction of major and minor water conservancy projects in rural areas besides road building and other construction works in urban areas.[15]China's collective structure mobilised more 'surplus' labour for capital construction than might have been possible under private ownership and the already high figures of 1960s were sharply increased in the following decades.[16]During the winter of 1957-58 alone, about a hundred million people were mobilised for construction work[17]. On one project itself-in the Hai He river basin-between 300,000 and 500,000 peasants were engaged in construction

13 See Wittfogel (1956, 1960).

14 Vermeer (1977) is an excellent study of water conservancy in the PRC. The second part of the Introduction (pp. 9-13) provides a comprehensive and elaborate description of the rather diverse and largely challenging natural conditions within which Chinese agriculture is placed. The occidental description of China as a "hydrological society" is amply clear from this work.

See also *Chinese Agricultural Geography* (ZhongguoNongye Dili) for a more detailed account of the soil geography of various agricultural regions.

15 "During 1950, about two-thirds of total civilian labour on water conservancy projects was performed in relief-through-labour programs and in 1951 perhaps half". Vermeer (1977:30).

16 Nickum (1978; 280-81) and Ishikawa (1981: 118-120).

17 Dutt (1967: 23)

work every winter during 1964-74. Tens of millions of others were also involved in similar projects all over theChinese countryside[18]. On the financial side, over the period 1950-80, about130 billion Yuan is estimated to have been invested in water conservancy[19]. Water conservancy was the major component of total investment into agriculture-accounting for roughly 50 per cent. The proportion of rural labour force mobilised, varied across provinces and across years depending on the demands and needs imposed by local conditions.[20] Peasants did over 80 per cent of water conservancy work during the winter and spring months, though this varied in the northern regions determined by their agricultural cycles and ecological conditions.

As regards organization of labour mobilization for water conservancy works, during the early 1950s, disaster relief and labour mobilisation for flood prevention and repair cum maintenance were combined. In 1958, the Department of Water Conservancy (DWC), an executive body and a planning organisation was merged with the Department of Electric Power (DEP) to form the DWC&EP. Decentralisation of the executive functions in this department was part of the overall decentralisation policy in the 1960s. The executive powers of provincial level departments of water conservancy expanded in scope and authority vis-à-vis the central departments; at least as regards small and medium-size water conservancy projects[21]. By the late 1960s and the 1970s, specialised farmland capital construction teams working all-year round on water conservancy, terracing, road improvement, land levelling, water and soil conservation, etc, were organised under the initiatives and authority of the provincial and local levels[22].

18 Several examples of labour mobilisation for water conservancy works are provided by Wheelwright and Mcfarlane (1970) Maxwell (1975) and Wakashiro (1990).

19 While the central government's share in this expenditure was 40 per cent (about 50.3b Yuan) the remaining came from provincial or local governments in various forms including labour. Considering the third plenum policy changes of 1979, where it was decided to do away with unpaid labour, the actual investment into water conservancy must have been considerably higher. Common references to the quantity of accumulation resulting from these efforts are largely in the form of volume of earthwork done or earth moved. For example during the first plan period, 8.08 billion cubic metres of earth was moved with the effort equivalent to 7.35 billion man-days labour between 1966 and 1975; similarly, in the winter months during 1971-75, on an average 15.5 to 18.6 man-days by 290 million peasants were devoted to water conservancy.

20 For a detailed survey of the variations see Vermeer (1977: 46-69).

21 For a sample organisational structure for specific river basins with regard to mobilisation of labour and execution of water conservancy work, see Vermeer (1977: figure on p. 39).

22 Vermeer (1977) provides some figures for the mid-1970s of the number of full-time (permanent) labour force for water conservancy and related activities. For instance in 1975, in Shantung (Shandong) one million people were maintained as full-time farmland construction force, out of a labour force of 30 million. A similar proportion is reported for Heilongjiang (200,000 in 1975 rising to 330,000 in 1976). In Shanxi, it was 7 per cent of rural labour force where as the figure for Guangxi was 10.6 per cent. (p. 68).

Prior to the mid-1960s, 1956-57 was estimated to have been the peak year in terms of volume of earth and stone-work done in various water conservancy projects (the figures for 1958 could have been higher but not available) [23]. In the 1960s when the projects were taken up again, the levels of 1955-56 were reached by 1965.[24]

Though the extent of labour mobilisation was large and mostly seasonal until the early 1960s in various parts of China, it is difficult to estimate a value for a particular year in terms of labour days worked for the entire country. There were discussions at both national as well as provincial levels as to the upper limit of the proportion of rural labour time that could be mobilised every winter and the following spring and this varied across provinces, communes, brigades and teams. There are also conceptual issues that complicate statistical estimations that are consistent and comparable over time.[25].

Nickum (1978) compiled information from various sources on labour mobilisation under the farmland and winter works programs for the period 1965-77. Tables 3.2b and 3.2c reveal the extent of mobilisation in terms of the numbers of participants over the entire period–from around 30-40 million in 1964-64, to doubling that by 1969-70 and more than treble by 1975-76. The measure of work done is represented by the volume of earth and stonework completed over the period–increasing from around 3.5-4.5 billion cubic metres to 15 billion cubic metres in 1974-75 and to 25 billion cubic metres in 1975-76.

The diverse set of activities and projects that together comprises water conservancy cannot be homogenously aggregated. First, the activity involved capital construction which includes soil and stonework that go into the erection of dykes, digging of canals as well as levelling of tracts of land in varying sizes and in different terrains. This activity was conducted at various scales with the larger projects involving labour in the millions, the small and medium sizes at the sub-provincial levels and also minor works at local (natural village/team) level.

23 Vermeer (1977) See Table 46.

24 Ibid, p. 61. On average around 17 million peasants were annually mobilised during the decade from the mid-1960s for capital construction in which the PLA also participated in a large way (p 63).

25 For example, the volume of earth moved is an important indicator of capital construction in water conservancy while participation numbers in this sector forms the indicator for labour deployment. The data for this indicator in the earlier years related to only the large centrally organized projects, but in later years included the relevant figures for local and medium level projects as well as all other earthwork, including maintenance. (Vermeer, 1977: 246-47) Table 46.

Table 3.2b: China: Winter Farmland and Water Conservancy Campaigns 1964-77

	Number of Participants (millions)	Earth and Stonework Completed (billion Cu. M)
1964-65	30-40	3.5
1965-66	40-60	3.5-4.5
1966-67	40-60	3.5-4.5
1967-68	30-45	2.0-2.5
1968-69	50-60	2.5-3.0
1969-70	60-80	3.5-4.5
1970-71	90	5
1971-72	80-90	4.0-4.5
1972-73	85-95	4.5-5.5
1973-74	110	6
1974-75	110-130	15
1975-76	130-150	25
1976-77	120-140	15

Source: Nickum(1978) Table 3.

Table 3.2c: China: Labour Mobilisation for Winter Farmland and Water Conservancy Campaigns, 1965-77

Region	Av. number of participants	Participation Rates*		
		1965-77	1965-71	1971-77
Loessplateau	11.41	0.196	0.173	0.212
Interior south	9.37	0.196	0.144	0.241
Border areas	6.17	0.187	0.208	0.201
North China plain	29.97	0.181	0.109	0.197
Middle Yangtse	24.17	0.172	0.101	0.226
Coastal south	9.64	0.165	0.105	0.245
Industrial northeast	4.85	0.131	0.066	0.167
Lower Yangtse	9.07	0.123	0.086	0.148
Sichuan	9.78	0.116	0.057	0.126
Yunnan	2.53	0.119	0.024	0.158
Municipalities	0.84	0.111	0.12	0.118
Total or Average	117.6	0.162	0.097	0.194

*Number of participants divided by 1971 rural population

Source: Nickum (1978) Table 4.

Secondly, maintenance of already existing water conservancy infrastructure entails dependency on weather factors, regular labour application, which is fundamentally determined by seasonal availability of water (either through precipitation or from other sources such as groundwater, or water diverted from a distance via canals) and

also the agricultural cycles (crop rotation whereby each crop's water requirement varies considerably). Thirdly, besides these core activities, there are also plot level capital construction and maintenance that ultimately determines the efficiency with which the benefits of the larger projects can be utilized. Particularly in the case of rice cultivation that requires not only proportionately the greatest amount of water per cultivated area, but also labour intensive water management at various stages of the crop growth. Irrigation is as important as drainage and both require enormous application of human/animal labour in the absence or limited availability of mechanised alternatives[26].

Some of the salient observations regarding water conservancy and water control over the period between the mid-1950s to the late 1970s are as follows. In the earliest years of the People's Republic, seasonal work towards water conservancy was of a semi-obligatory character. Before the establishment of the RPCs, remuneration was largely in the form of food grains, which was above the consumption requirements of the labourer providing some savings that could be carried over for the family. Except where the work was local or near the village, the minimum remuneration was in the form of a prescribed quantum of food grains for the entire period of work. As it evolved, the system was continuously modified and piece-work system of compensation was introduced depending upon the amount of work done and the degree of difficulty[27].

The need and the rationale for the centrality of water conservancy (defined in the broadest sense) derive from the importance of rebuilding and stabilising agriculture, without which the other fundamental objective of industrialisation would not be achievable.[28] There was already a historical practice in China of involving corvee labour for water conservancy works by the state and intermediaries at various administrative levels. The organisational strengths during the early years–the 1950s-derived from collectivisation, enabling mobilisation of unprecedented numbers of people for these

26 Numerous illustrations of the labour mobilisation for various large projects as well as medium sized projects across different provinces and river valleys for various years, are provided by Vermeer (1977).

27 See Vermeer (1977: 69-105) for the evolution of wages and social insurance in water conservancy work in various localities and provinces during 1950-77.

28 In *Ten Major Relationships*, Mao (1956), put forth the essence of his development strategy, which conceptualised a triangular relationship between agriculture, light industry and heavy industry. Expanding light consumer industries and making them available to agricultural producers would motivate the latter to improve productivity, through which in the next cycle, a greater amount of capital could be raised for heavy industry. "This mode of rural/urban trade provides a reasonable alternative to other means of generating capital from the countryside" viz. extraction by a landlord or intermediary classes or excessive taxation by the state. Therefore, the "Chinese procurement and pricing policies have much the same capitalizing effects, but without draining the countryside of its resources or dampening the urge to re-invest, and without most of the cruelties inherent in other systems" (Gray, 1978: 591).

projects. However, by the late 1950s, the scale of mobilisation had overwhelmed even the collective organisational structure making management of such large deployments of labour difficult. The scale and diversity of water conservancy work, which was initiated on the basis of organisational strengths, soon acted against it. In the 1960s, various provincial decisions on the quantum of labour mobilisation and its application took shape.[29] By the mid 1960s and early 1970s, conforming to the overall decentralised strategy, projects under the communes and brigades were smaller and the work under this tier was local in scope, with the larger projects becoming more regulated and coordinated by higher levels of the administrative hierarchy.

Several objectives were achieved through these efforts, viz. effective utilization of surplus labour by transforming labour directly into capital, increases in cultivated area and assured irrigation for an increasing proportion of the total cultivated area. In sum, this enabled increases in grain output above that necessary to feed a growing population as well as providing for the wage goods requirement for the urban population over a long period. The essence therefore, of the Chinese example in this regard was the practical demonstration of Nurkse's (1958) ideas regarding transforming disguised savings potential in disguised unemployment into effective savings[30]. Rawski (1979) estimated that 2/3rds of the 150 million added to the total labour force during 1960-75 was absorbed in agriculture, where mobilization played a substantial part[31]. Along with collectivization, the rapid growth in the supply of manufactured inputs to agriculture, which began in the early 1960s, created a large demand for labour.

Nickum (1977) also provides an overview of the irrigation and water control organisation in China prior to reforms, including the technical/technological aspects[32]. Some of the water control projects are described in detail. Labour mobilisation and

29 See Gray (1978) for a discussion of the political problems that emerged due to excessive mobilization in some provinces and disputes regarding remuneration. Ishikawa (1982: 7-8) mentions that in July 1978, at a National Farmland Capital Construction Conference, Li Xiannian, a vice-premier criticized the excessive rural labour mobilisation and advocated 30 per cent as a reasonable proportion for the winter-spring water works programs with 5 per cent in permanent construction corps.

30 Gray (1974: 43) notes in this regard that even before the publication of Nurkse's theoretical model, "Mao had begun to act on assumptions similar to those of Nurkse's."

31 The National Program for Agricultural Development, 1956-67 had a well-defined goal with regard to employment. "In seven years starting from 1956, every able bodied man in the countryside should be able to work at least about 250 working days per year.... Every able bodied woman in the countryside should, apart from the time spent on household work, be able to give no less than 80-180 days a year, to agriculture or sideline occupations". Kuo (1976: 276).

32 See Nickum (1977: 19), Chart 1, and Vermeer (1978) for the organisational structure of water control. See also Nickum (1980).

its compensation has been a subject of debate on the issues of coercion as opposed to voluntary contributions and work point system as opposed to wage compensation. The overall 'wage bill' which is the net output set aside for consumption was fixed, permitting only those whose higher work points or labour contribution entitled them to a larger share of the fixed total: "The net product is the same no matter how many work points have been earned; what varies is the value of each work point. Those who do more work receive more work points and therefore a greater claim on output".[33]

Ishikawa (1982) examined the enormous capacity of agriculture to absorb a large proportion of labour force added during 1957-77, noting that there were six factors that determined the relative labour absorptive capacities of agriculture and non-agriculture:

1. Initial conditions of the economy,
2. Size and speed of the growth of labour force,
3. Availability of capital,
4. Mobility of capital, food grains and other resources,
5. Technological conditions in both sectors and
6. Government policy on all the above factors.

Of the 156 million additions to the labour force, about 2/3rds (100 million) were absorbed in crop cultivation, construction of irrigation and water control facilities. Local small industry engaged in production of fertilizers and other inputs, besides small tools as well as mechanical machinery and farming equipment–all of these activities were closely allied to agriculture which also provided the bulk of investment funds to set up production units. A mid-1965 survey on labour accumulation arrived at a figure of 20-30 per cent of total work time of the rural labour force and found it to be appropriate to the agricultural situation.[34]

Ishikawa (1982) notes that changes in cropping systems in the 1950s and in the 1970s also enabled increased labour absorption in agriculture. The first round of changes was implemented in the Yangzi River Valley Region, where the existing system of a single crop of rice and an additional crop of wheat or an oil-bearing crop was intensified to two crops of rice and an additional crop. The existing inter-cropping was converted to continuous cropping over a considerable area. In the North China plain, from three crops every two years-one main crop of miscellaneous grain plus

33 Nickum (1977: 24).
34 Ishikawa (1982: 7-8).

one winter crop-was converted to two crops per year–mainly wheat and corn. In the second round, double cropping of rice in the Yangzi region was extended to three crops a year by adding wheat or barley. In North China plain a three crop per year system was attempted. Both these changes brought about a remarkable increase in labour application per hectare. In the Yangzi region, labour days worked is said to have increased by one estimate from 500 in the 1950s to 1500 by the late 1970s.[35]

Rawski (1979) estimated that between 1957 and 1974, labour intensity in agriculture grew by 3.5 per cent per year, whereas output of grains increased 2.1 per cent. The change in the composition of output clearly helped generate more employment. During this period, nearly 100 million new labour was absorbed by the agricultural sector alone. Additionally, number of days worked per labourer rose from 175-190 days per year in the late 1950s, to 272-284 days per year in 1975.[36]

In this period, the industrial sector was also significant in terms of labour absorption. The share of industrial employment doubled from 6 per cent to 12 per cent of the labour force (absorbing an additional 48 million workers). The difference between these two sectors was that while in agriculture, productivity and remuneration to labour did not increase significantly, in industry, productivity increased considerably and although wage levels were much higher than in agriculture they declined over time.[37]

The issue of financing capital construction and therefore estimations of investment for the same is a complex exercise. Ishikawa (1981) examined data on flow of state finance for agricultural support (operating expenditure plus capital construction) and concluded that the volume was about 5 times the value of tax collected.[38] In addition outstanding loans from the state banks to the communes and farms were about 4 times the same. After 1958, the collectives took about 70-80 per cent of the financial burden of large-scale irrigation projects.[39] In some cases, up to 90 per cent of the burden fell on collectives. During the 1960s, the State increasingly limited

35 Ishikawa (1982: 14).

36 Rawski (1979).

37 Ishikawa (1982: 2 Table 1) notes that high capital-labour ratios, along with higher productivity and wage levels in industry, meant that more labour intensive techniques would have absorbed a far greater proportion of the increase in labour force during the period, (p. 3)

38 See Ishikawa (1981:120). Nolan (1983) quoting Zhang Lizheng (1980:35) points out that provincial data shows that between 1949 and 1979, 76 per cent of total agricultural capital construction was financed by sources internal to the communes. There are however questions about the relative autonomy of teams vis-a-vis the higher administrative tiers and the 60 Articles provided for extensive intervention by the higher levels in the production plans of the teams though the latter were allowed to adapt to local conditions

39 See Vermeer (1977: 259 Table 50).

itself to providing materials and larger machinery, and if needed a small number of skilled labour. But the labour came from the RPCs.[40]As noted earlier, inter-sectoral terms of trade were favourable to agriculture in the 1960s and the 70s.

The discussion so far in this section, was an attempt to present a summary of the efforts in the area of water control and conservancy in the course of close to three decades beginning in early 1950s. The translation of these efforts into making Chinese agriculture 'water-secure' can be evaluated by examining the progress in irrigation. The statistical summary with regard to irrigation presented earlier, showed that by 1979 over 45 per cent of total cultivated area was irrigated–an impressive figure by developing country standards. This figure however, reflects only a general picture with regard to water availability. For a better understanding, the definitional problems relating to irrigation need elaboration. These are now taken up for a brief discussion.

WATER CONSERVANCY AND IRRIGATION

The nature of Chinese agriculture in terms of the complex patterns of cultivation, varying scales of operation, cropping cycles etc, determined by ecological conditions, poses problems in defining what would constitute irrigated areas. Generally,irrigation capacity is defined by the ability to cope with) drought or deficiency of water availability–thus, irrigated land can sustain 30-40 days without rain, or 50-70 days in areas adapted to double rice cropping. Irrigated land also means protection against excess water brought about by floods or precipitation where drainage capacity also needs to be recognized. Thus, the category of 'high and stable yield areas' introduced in 1964 included both aspects. Each province therefore had a specific norm, moderated to reflect local differences due to ecology and the crop-mix. But in general, irrigated area refers to prescribed limits of sustainability to drought conditions.[41] One of the pre-requisites of stable high yield farmland is "guaranteed irrigation" which can sustain even the usual once-in-10-year drought. 'Effective irrigated area' is the area actually capable of receiving irrigation water and this category was introduced to differentiate from the irrigated area figures of the GLF, which were inflated and based not on actual irrigation but the capacity of the irrigation projects to provide water to that area of land. For the period 1965-70 however, data on irrigation (and also other statistical information in general) are either not available or unreliable.

40 Vermeer (1977: 261).

41 See Vermeer (1977: 85-7) for provincial standards and the extent of irrigated areas during the 1960s.

Despite the empirical problems, Nickum (1995) notes that "irrigation statistics are very important to Chinese food policy; they are relatively complete, compared to most other countries". Further, "China's irrigated area statistics rank among the world's most comprehensive, consistent, frequently reported, and, presumably, accurate data. Nonetheless, they are prone to many problems of definition and agency bias, which China shares with the rest of the world."[42] But the problems with regard to irrigation statistics stem from the nature of irrigation itself: "Measures of irrigated area rival those of employment or capacity utilisation: the correspondence between the numbers and the underlying reality they claim to measure is problematic". Neither deficit nor excess water available at all stages of a crop cycle would constitute effective irrigation. Excess of water due to natural climactic variations manifesting in floods, require an effective method of removal of water that depends on the severity and area of land affected, as well as the resources to do so. As regards deficit, the magnitude is dependent on several factors such as "the amount and pattern of precipitation, runoff and evapo-transpiration during critical growth periods, the types, varieties, numbers, and planting dates of crops, soil and slope conditions, methods of water application, and levels of management" Even available levels of inputs such as labour and fertilizer determine the magnitude of water needs and therefore its deficit.[43]

Officially, there are four types of irrigation statistics: Effective Irrigated Area–EIA, Actual Irrigated Area–AIA, Stable High-Yield Fields–SHYF and Guaranteed Irrigated Area–GIA. EIA refers to actual command area of existing projects but the criterion for determining the effectiveness of irrigation in EIA is the "rate of irrigation guarantee". This rate expressed as a percentage of years during which the fields receive the amount of water required by crops from irrigation facilities. The standards of guarantee differ across provinces and therefore inter-provincial comparability is difficult besides problems of aggregation.[44]These classifications are based on long-term use and relatively fixed conditions of irrigation. Upland crops can be grown in bunded fields in drought years or as part of a normal rotation such as rice-broad beans; and irrigated dryland may not receive irrigation in extremely dry or fortuitously wet years. Thus EIA tends to be greater than Actually Irrigated Area–AIA.

Stable High-Yield Fields are "fields with stable, high yields despite drought or excess surface water" In addition, the unit area (crop) yield reaches or exceeds the requirement of the NADP under the conditions of a normal year. EIA, AIA and GIA) represent what can be categorised as "command area" measure–the area that can

42 Nickum (1995: 20, 77).
43 Nickum (1995: 21).
44 See Nickum (1995: 43) Table 9 for provincial comparisons.

be adequately irrigated with existing facilities under normal conditions. "Adequate" and "normal" vary considerably across provinces and Actual irrigated area is self-explanatory.

Table 3.3: China: Irrigated Areas, 1965-79

	Area, 1000 ha		Share in Cultivated Area, %	
	SSB	**MWR**	**SSB**	**MWR**
1962	30545	30744	29.7	29.9
1965	33055	32036	31.9	30.9
1970	36000		35.6	
1972		40645		40.4
1973		44000		43.9
1974		43811		43.8
1975	43283	47597	43.4	47.7
1976	45463	45463	45.7	45.7
1977	45021	48187	45.4	48.6
1978	44965	48455	45.2	48.8
1979	45003	48295	45.2	48.5

Note: SSB and MWR are State Statistical Bureau and Ministry of Water Resources respectively.

Source*:* Nickum (1995:85-6 Table A1).

Table 3.3 presents two series of official data on irrigated area compiled in Nickum (1995). For the period of the second half of the 1960s, data is not available and the improvements in irrigation over the period 1965-79 can only be inferred by examining the figures for 1965 and those for the 1970s. It can be seen that by 1976, irrigated area as a proportion of cultivated area, had expanded by over 50 per cent compared to 1965. In the 1970s, the major plank of stabilizing and improving agricultural production was mechanization and in the sphere of irrigation, mechanical equipment largely determined the effective use of water made available. Therefore, mechanization of agriculture in China in the period under study relates equally to its role in irrigation as in labour saving. Table 2.7 in the previous chapter showing large increases in the power-irrigated area, demonstrates the significance of policy in this regard.

While efforts towards enlarging water conservancy infrastructure and at the same time effectively control water, stabilised the conditions necessary for maintaining agricultural output, population growth and the demands of an industrialising society required at least a commensurate rate of increase in food production and

availability. With the scope for enlarging cultivable area severely limited, technological improvements based on modern science became indispensable by the mid-1960s. The next section examines developments in this regard.

AGRICULTURAL TECHNOLOGY AND MODERNIZATION

Perkins (1975) noted that in the 1950's, the agricultural development strategy to achieve rapid increases in output was based essentially on massive application of traditional technology. From the mid 1960s the emphasis shifted in favor of expanding productive capacity by means of rapid mechanization appropriate to local factor endowments as well as the specific demands of agriculture dominated by rice cultivation. This was to be achieved by expanding irrigated area, increasing inputs such as chemical fertilizer and simultaneous propagation and greater use of high yielding crop varieties. The policy known as "Agriculture First", initiated in the early 1960s, included a re-invigoration of the earlier integrated rural development strategy. Besides aiming for optimizing factor utilization (large under-employed labour) and transferring technological capacity to rural areas, it also complemented the agricultural strategy.

From the statistical profile presented in the previous chapter on mechanization and chemical fertilizer production (as well as application), it was clear that rapid progress was achieved in both these areas. The expansion of irrigation discussed in this chapter, is in the context of labour absorption and employment generation, as it is closely tied to the strategy of labour accumulation. As regards the fourth component of agricultural modernization, namely development of high-yielding crop varieties, the discussion delves into the institutional framework of agricultural research and extension. A high priority to agricultural research is evident from the sheer number of institutions, technicians and other personnel involved in the network. In 1956 there were 14,000 agro-technical stations employing about 95,000 staff, to facilitate practical application of research. In 1963, about 100 research institutions relevant to agriculture had been established employing over 10,000 people.[45] By 1976, roughly 13 million people were involved in research and extension network at all levels. This meant an average of 200-300 people for every commune or 2-5 persons for each of the over 5 million production teams.

Stavis (1978a) remarks that the political and institutional framework is central to understanding the effects of technological and scientific inputs into agriculture.

45 Data from Cheng Chu-yuan (1965); Stavis (1978); Leo Orleans (1961). The agricultural research budget in 1963 was of the order of US $ 330 million representing about 1.7 per cent of value of agricultural production–a high proportion by international standards.

Griffin and Khan (1978) summarized this issue by noting that in most countries, agro-technological development enabled a greater concentration of resources in the hands of the already powerful classes in the countryside[46]. In China, under the collective framework, not only was this problem avoided, instead electrification and mechanisation had several positive spread effects on rural economy and society. As Vermeer (1977:267-8) notes:

"In the early sixties, the State put the small amount of agricultural machinery available to concentrated use, and gave the initial push for agricultural mechanization, for the electrification of the deltas of the Pearl River and the Yangtse River and for the construction of small hydroelectric power stations in the countryside. This state-directed development concentrated on the creation of stable and high yield farmland in the regions with the best economic prospects and was effected mainly with state funds. Only after a larger supply of agricultural machinery had been created and the modernization centres began to have an impact on their surroundings, after the "demonstration effect", the improved schooling, the build-up of feeder lines, of repair factories etc. had done its work a more self-reliant development of the People's Communes is possible."

While institutional and organizational factors remained the foundation for overall agricultural progress in China, technological factors built up the momentum for rapid growth. In the early 1950s, the core strategy was expansion of multiple cropping along with a gradual introduction of hybrid varieties mainly in rice, cotton and wheat. Until 1964, when the first breakthrough in full scale distribution of fertilizer responsive high yield varieties began, increases in agricultural output and productivity came about through sustained increases in organic fertilizer application, soil improvement measures, and the intensive use of labour inputs into crop management practices.

Wiens (1982) notes how the high labour intensity in agriculture facilitated scientific enquiry and made possible evaluation of thousands of cross breeds by the cultivators themselves across the entire countryside[47]. The major breakthrough in agricultural research was the development of a high yield rice variety in 1964, two years ahead of its equivalent the IR-8 that launched the green revolution in the rest of Asia[48]. By the 1980s, the agricultural research system had developed into an extensive network organized at 4 levels (county level agricultural stations, prefecture, province and national level research institutions)[49]. By 1979, over 89 per cent of total

46 Griffin and Khan (1978: 632). This argument also applies to the politics of agricultural mechanization. (Stavis, 1974)

47 Wiens in Barker et al (ed.) (1982: 117).

48 The Chinese variety matured 10-15 earlier than the IR-8, see Stavis (1978b: 638).

49 For a discussion see Stavis (1978b)

rice produced was high yield variety. For wheat, cotton and soya the proportions were 85 per cent, 60 per cent and 75 per cent respectively[50].

Wiens also notes that the primary focus of the agricultural research system in China was on varietal improvement. The newly developed seeds were fertilizer responsive, lodging resistant, dwarf rice varieties with potentially high yields. This was achieved after several years of field-testing of dwarf varieties of rice. These were capable of high yields of 5-8 tons per ha at high levels of fertilizer application and were ready to be distributed. These were also rapidly maturing-80-100 days after transplantation. National economic plans in 1961-62 had prioritized fertilizer production and manufacture of pumping equipment that made it feasible in 1965 to plant over 3 million ha of these new varieties (Stavis, 1978).

It must be mentioned here that, the agricultural research system followed an "open door" policy, implying free exchange between laboratory and farm. Under this policy, agricultural research and extension involved the 'three-in-one' policy where the farmer, technician and scientist all participate in cooperative research programs. The American Wheat Delegation to China in 1976 reported that under the Chinese agricultural research system, plant pathology and entomology were combined into one of-plant protection–and that China, according to official sources, had the largest number of plant protectionists in the world, numbering around 50,000.[51] The main method was traditional–development of resistant varieties by conventional breeding. The delegation further noted, that "the Chinese have been very successful in nearly eliminating certain seed-borne pathogens of wheat and rice by their strict adherence to principles of clean seed and quarantine".[52]

Following decentralization by 1976, many research institutions were transferred to the provincial level, along with the creation of research stations at commune levels and research groups in brigades and teams–involving roughly 13 million personnel in this network, averaging 2-3 persons per team (of 5 million teams) or 200-400 per commune.[53] Thus, decentralization was not merely with regard to production decisions, but comprehensive, including research and extension. But modern scientific research institutions were not eliminated. Research on plant genetics and pollen culture besides other aspects, were carried out in about 25 national level institutions, well equipped with modern laboratories and qualified personnel.[54]Stavis

50 Wiens (1982).

51 See Johnson and Beemer (1977)

52 Johnson and Beemer (1977: 41).

53 See Stavis (1978b: 633-34).

54 The American Wheat delegation visiting China in 1976 noted that the network of agricultural research institutions also included specialized research stations that focused on other aspects of agricultural needs such as irrigation. See Johnson and Beemer (1977)

(1978) notes that agricultural extension as a separate concept by itself, was eliminated as each unit at each level functioned as a scientific research unit that not merely transferred and dispersed information, but also created new information in a two-way feedback between units at different levels.

Chinese high-yielding rice varieties matured 10-15 days earlier than the well-known IR-8 developed by the (International Rice Research Institute) (IRRI). In 1977, Chinese hybrid rice was test-sown on 2 million ha, producing yields that were 20-3-per cent higher than conventional varieties. Besides considerable research and experimentation in the areas of tissue culture and pollen culture as well as biological processes in plant development, China was perhaps the first country to have successfully achieved anther culture in wheat.[55]

By 1975, grain production had reached 285 MT from 250 in 1971, largely as a result of the spread of tube-well irrigation in North China and the expansion of chemical fertilizer industry, besides the contribution of the integrated agricultural research-extension system. In 1976, the second breakthrough was achieved, when China became the first country to launch a programme on a national scale to distribute hybrid rice varieties. By 1979, 89 per cent of rice grown was high-yielding variety. The figures for wheat, soya and cotton were 85 per cent, 60 per cent and 75 per cent respectively. Besides, the share of high yielding varieties of peanuts was 70 per cent. (Stavis, 1978b).

This chapter has so far attempted to place China's agricultural growth experience within the broader framework of the economic and social development strategy that was launched in the early 1950s. The basic objective of institutional reorganization in rural China was to raise the productive potential of the agricultural sector and ensure that growth in production was stable and sustainable. There was another important aspect of agrarian change in pre-reform China, which concerns rural transformation in which rural industrialization was a key episode. This forms the topic for a detailed examination in the following section.

RURAL INDUSTRIALIZATION

As in most densely populated agricultural societies, the rural sector as a whole occupies a central position in the context of economic development and social change. In his study on Mao's writings and policies concerning rural industry, Gray (1978) concluded that labour, particularly community-based labour, if

55 Stavis (1978b)

appropriately transformed, could overcome obstacles such as the shortages of land, capital, technology, foreign domination and entrepreneurship that had challenged 19th and 20th century China. The important points in this regard were: Labour can overcome shortages of land and capital as well as technology; community-based rural industrialisation and decentralisation hold the keys to expanding employment, income, consumption and markets and egalitarian development, including intra-village and urban-rural equality, can provide the foundations for sound and swift development.

Gray (2006) proposed a thesis that the success of China's commune and brigade industries in the 1970s, were a resurrection after their failure during the Great Leap of 1958-62. On the question of whether Mao's strategies and policies were a blind implementation of his theoretical principles or whether his theoretical principles were merely a rhetorical re-phrasing of strategies and policies decided upon for pragmatic reasons, Gray concludes that the strategies were pragmatic. Nurkse's (1958) new development paradigm argued that rural surplus labour of many peasant societies could be turned from a burden into a resource, utilized to increase production, diversify crops, improve agricultural infrastructure, and create labour-intensive, low-tech village industries. This had formed the basis for the GLF strategy.[56]

"The bottom line of his economic programme was the nature of China's factor proportions: too little land, too little capital and a vast surplus of rural labour. That surplus could be a burden or a resource…Hence his idea of a spiral of growth in the villages beginning from simple, labour-intensive, nil-gestation investment and leading on to the modernisation of rural china".[57]

Chinese planners learned from the GLF experience that rural industrialization administered and controlled at the commune level, posed major problems with regard to coordination of inputs and outputs, as well as to the appropriate size of industrial units for various products. The rural industrialization strategy of the 1960s was therefore modified, based on a differentiation of industrial activity in terms of products, size and local requirements at the three levels of county, commune and brigade. As Sigurdson notes "organizational structures concerned with development questions rather than merely governmental administration, gradually emerged at all the three levels"[58] Rural industrialization was also envisaged as integral to mechanization of agriculture. Besides processing of agricultural products, rural industry increasingly

56 Gray (2006) suspects that Mao or someone close to Mao was aware of Nurkse's work. But this is a contentious matter.

57 Ibid, pp. 661-664. This was Jack Gray's last essay published posthumously in CQ, September 2006, No. 187, "Mao in Perspective"..

58 Sigurdson (1978: 672).

diversified into production of small tools and implements, simple machinery for basic agricultural operations such as preparation of soil, sowing, weeding as well as harvesting. Further, larger and more complex mechanical machinery was sought to be produced, serviced and maintained at the brigade and commune levels.

The history of Maoist economics in this context however, extends retrospectively to the 1930s, long before the founding of the People's Republic As Gray (1978) notes, "the history of Maoist economics began in the Jiangxi soviet from which experience the basic land distribution policy emerged and formed the basis of Agrarian Reform Law of 1951."[59] It was during the anti-Japanese war and the in the Border Regions–especially the Yenan region–that the Maoist economic model was first adumbrated." Capital scarcity was expected to be overcome by labour, improvised techniques substituted for advanced technological devices and on the organizational question, local initiative was substituted for centralized planning. Nurkse's idea about surplus labour accumulation, intermediate technology and local community development, characterized these early attempts well before theoretical formulations of these concepts were developed in the economics discipline in the western world. The Chinese industrial Cooperatives (INDUSCO) organized by the (non-communist) state before 1949 used improvised methods and local resources to develop Chinese industry. These were later re-introduced during the GLF but failed and revived again in the early 1960s. The guiding INDUSCO belief was that local community enterprises by the re-investment of their profits could develop "from native to modern, from small to large and from simple to complex". This was borrowed and applied later during GLF and the rural industrialization of the 1960s and the 1970s.

Sigurdson (1977) also notes that rural industrialization in China was first "a logical outcome of a sector strategy involving technological choices in a number of industrial sectors–most of which were initiated in the great Leap Forward or earlier. Second, rural industry is part of an integrated rural development strategy-also initiated during the Great Leap Forward–where a number of activities are integrated within or closely related to the commune system"[60]

However, the nature and overall objectives of rural industrialisation initiated in 1958, differed fundamentally from that of the mid-1960s. Being part of the Great Leap Forward strategy, the earlier rural industrial program was an attempt to expand industries too rapidly without adequate planning and technological analysis. The later programme was complex in terms of organisation and objectives, given the diversity in local conditions in various parts of the Chinese countryside. The organisational

59 Jack Gray (1978: 568).
60 Sigurdson (1978: 411).

complexity that emerged from a decentralised strategy was reflected in various types of ownership and control, depending on the administrative level at which industrial units were established. Moreover, there was a wide diversity in terms of technology, scale of operation and products, which depended on local conditions in agriculture, resource availability, and proximity to urban centres as well as financial conditions.

The strategy is captured by the slogan "walking on two legs" that sought to address imbalances in 5 relationships: those between industry and agriculture, heavy and light industry, large production methods as opposed to indigenous techniques and finally centrally administered enterprises and local enterprises. While scaling down of modern large scale technologies was part of a sector strategy (mostly experimented in the GLF period), the overarching programme was one of an integrated rural development strategy, that was directed to address the question of disparities between city and countryside as well as to achieve a broad based socio-economic development in rural areas.

Rural industrialisation was not part of a national industrial policy but integrated into an overall development strategy. "Although rural industry is an integral part of the Chinese development strategy, there is no general pattern of industrialization that applies to the whole country"[61]. An important objective of the strategy was to develop smaller county centres that would be integrated into the future industrial structure–"shifting the industrial growth from metropolitan areas to secondary urban centres" (Sigurdson 1977: 14).

Thus, rural industrialisation in China cannot be understood as comprising a homogenous structure that can be analysed with the conventional tools of economic analysis to ascertain or evaluate the efficiency parameters. This is again not merely because of the localised characteristics-conditioned by local resource availability for material inputs as well as labour time permitted by the predominant activity namely crop cultivation–but also other aspects such as transport networks, multiplicity of technological adaptation and innovation and skills regarding organisation and production processes. Agriculture was to remain the primary nodal determinant of the scope and content of rural industrialisation. The secondary consideration was with regard to employment of labour time in excess of that required for agriculture (Sigurdson (1977), thus describes it as "Rural Industrial systems").

Besides, the 'five small industries" that were referred to as heavy small-scale industry, several consumer goods were also manufactured–like sandals, shoes, etc. The types of products varied with different administrative levels such as:

61 (Sigurdson, 1977: 22)

1. Mechanical inputs–county, commune, brigade (only blacksmiths with simple machinery);
2. Chemical inputs–county-level; mixed and simple phosphate at commune-level also;
3. Consumer goods–all levels, except complex products such as plastic based only at county level;
4. Agro-processing and sidelines, forestry-based and mineral-based–brigades and communes; and
5. Handicrafts–commune, brigade as well as household.

Fertilizer production in the small rural sector has been evaluated as being more expensive per unit of output (in tons) compared to very large plants that were imported from the mid-1970s onwards.[62] The plants that were set up first in the late 1950s, were closed down following technical deficiencies and economic difficulties that afflicted rural China following the setbacks of the GLF. But by early 1974 there were 1800 small-scale rural units spread all over China producing about 54 per cent of total national nitrogen fertilizer production of 15 million tons.[63]

With regard to cement, in contrast to rural small-scale fertilizer production, while investment cost per ton was higher in small scale plants–more than double–relative to larger scales of production, this was only a little over half in comparison to imported large scale plants.[64] A further contrast was with regard to changes in the average

62 See Sigurdson(1977: 149 Table 35) for the list of imported plants, their capacities and cost of installation. He estimated the capital cost of installation of an imported plant for nitrogenous fertilizer to have been about 322 Yuan per ton, whereas for a small indigenously built plant, this amounted to 1030 Yuan. But adding peripheral and site construction costs, the former rises to approximately 575 Yuan compared to 700 for the latter. Given foreign exchange constraints he argues, the existing shadow pricing could easily compensate for the volume of investment necessary for a minimum size of a large plant of 365,000 tons per annum, compared to a domestic plant with an annual production capacity of 5000 tons. Transport costs both for input movements and distribution across a wide geographical area is another factor that favours smaller indigenous plants besides the employment potential (pp. 142-148)

63 Ibid pp. 134-35. In 1973 rural small-scale plants were producing 75 per cent of total phosphate fertilizers. The discussion on the economics and rationale for small-scale rural industrial production of fertilizer as well as cement is elaborated in ibid. Chapter 4.

64 Ibid, Table 40, p.160. An imported plant with an annual production capacity of a million tons was about 70 Yuan per tonne, whereas, for a small-scale rural plant of 32,000 tons capacity, the investment required was only 37.5 Yuan. But the major achievement of economies of scale was in the case of large indigenous plants with capacities of roughly half a million tons and over 0.7 million tons per annum, where the investment cost per ton was 19.5 Yuan and 17.6 Yuan respectively. This is attributed to the technological expertise of Chinese engineering industry that achieved such economies of scale

scale of operation in nitrogenous fertilizer and cement production over the period 1965-73. While in the former it increased, rural cement plant sizes fell consistently[65]. In any case, transport costs more than offset the economies of scale that large plants offered and until rail transport networks were developed, it was economically viable despite the quality that was 25 per cent lower, to produce cement in 80 per cent of the counties by the mid-1970s. Between 1965 and 1973, rural cement production rose from 5 million tons to 19 million tons. Correspondingly, the number of plants increased 14 times to reach 2400. The increase in the latter was also brought about by a reduction in average capacity from 25000 tons to 6800 tons, which implies a greater regional spread as well as increased but dispersed employment[66]. As in the case of other industries, the scope for imparting industrial process technology as well as engineering and other skills to a large and regionally spread rural population, was immense.

Farm machinery production and maintenance in small-scale rural units was also accorded a high priority in the overall integrated rural industrialisation strategy. Except for sophisticated and complex technology based machinery such as large tractors and electrical equipments, almost all communes had some form of small machine tools and machinery maintenance stations. Most had the capacity to assemble and repair other mechanical and electrical equipment used in agriculture but manufactured in urban industry with greater technological capacity. In the case of Iron and Steel production, small-scale industry proved expensive, except when appropriate raw materials and inputs were locally available in adequate quantities. This sector therefore accounted for not more than 12 per cent of total output of steel and 27 per cent of pig iron in 1972.

The most successful of all the small-scale industrial sectors was in hydroelectricity, which was part of the discussion in the previous chapter. The justification of rural industry was economic as well as political. In the short run, it involved a reduction in overall growth rate because of the need to transfer technical, financial, and planning resources to rural areas in order to initiate rural industrialization programs. In the long run however, rural industrialisation contributed to a more rapid economic growth than would otherwise have been possible. The rationale here is that a decentralised pattern of industrial development is likely to lead to a less capital-

inherent in plant manufacture. (Ibid, p. 161).

65 Besides, economies of scale that operated in opposite directions in the two industries, a greater control over quality was also possible in both products for the same reason. Additionally, very small cement plants could be more easily constructed with scrap and idle equipment from other industries that was not feasible with nitrogenous fertilizer plants. (see ibid, p. 155).

66 Ibid. Table 38, p. 153. The share of rural plants in total production also rose from 30 per cent to 50 per cent during the same period.

intensive expansion of industrial growth–suited well to given factor endowments and relative factor prices. Second, integrated rural development pre-empts the problems associated with expanded urban centres and mass movements of population towards cities. Third, agriculture and non-agriculture are both promoted by this strategy in the same local areas.

As regards employment generation by rural industries, Sigurdson (1978) notes that rural industrialization served a more important function as an instrument for regional development and skill formation than employment generation. The latter automatically accompanied rural development[67]. It is estimated that in 1973 rural collective sector employed about 12 million workers accounting for 24.25 of the industrial labour force, though producing only about 6 per cent of industrial value added–however, rural areas also have state-owned relatively large industries that contributed about 8 per cent of value added and employed an additional 6 million, thereby accounting for 36 per cent of industrial labour force.

There were three differences between state and collective industry:

1. Control–national or provincial plans vs commune and brigade plans
2. Higher vs lower capital-labour ratios and
3. Level of technical/technological development.

Owing to these three differences, productivity in State industry was far higher than rural industries. But the significance of rural industry lay in the fact that during the 1970s, this sector contributed approximately a third of rural GDP. Besides, capital requirements were considerably reduced, as housing and transport infrastructure needs were minimised. Plant and machinery from larger industrial units can be adapted by down-scaling, leading to savings in foreign exchange as well as capital costs. As Sigurdson notes,

"…the encouragement of efficient and productive small-scale industries in rural as well as urban areas has never been presented as an alternative to the development of medium and large-scale enterprises. They have always been seen as a complementary element in the industrialisation process. … The provision of a strong and viable development basis in China for small-scale industries is likely to have significant long-term economic as well as social advantages"[68]

67 Sigurdson (1978: 670).
68 Sigurdson (1977: 435).

CONCLUDING REMARKS

This chapter began with an examination of the broader question of the role of agriculture in economic development. The deficit in capital required for industrialisation was overcome by the mobilisation of the more (seasonally) abundant labour resources in rural China. Given the system of accounting, in which prices do not reflect demand or supply in the same manner as in a market economy and values are derived differently, it is difficult to estimate the volume of resources that flowed out of the rural economy. But the estimates by some scholars discussed above, do indicate the enormous contribution of rural labour in this regard.

The role of mobilisation of labour was indispensable to strengthen the agricultural sector itself. Capital infrastructure in agriculture, largely in the realm of water management and control, was meant both to reduce the impact of climate and weather factors and to expand production. From the second half of the 1960s, the transition of Chinese agriculture was also towards rapid modernisation, in terms of seed technology, mechanical power besides chemical fertilizer application.

Perhaps, the most remarkable transformation was the successful adaptation and implantation of small-scale modern industry in rural China that was functionally designed to be integrated with agriculture. The rural economy in effect not only performed the traditional historical role in providing resources for modern industrialisation but also to industrialise in its own space. Collective institutions however, provided the structural foundation on which the Chinese experience was realised.

There is a further dimension of China's rural transformation that requires elaborations, concerning improvements in the level and composition of rural consumption. The next chapter delves into the trends in the most fundamental of the consumption basket, namely food during the period under discussion.

4. Food Production, Availability and Consumption in China-1965-80

4.0 INTRODUCTION

This chapter completes the discussion on agrarian change in pre-reform China by examining the role of agriculture on the consumption (food supply) front. In other words, the role of agriculture in meeting the nutritional requirements of a growing population on a low and almost fixed quantum of cultivable land has been evaluated here, by studying the trends in consumption of food during the period 1965-78. The rationale for this exercise is based on the understanding that an overall transformation of the rural economy involves changes in both productive efficiency as well as what may be described as the efficiency of consumption in terms of a desirable level and distribution of food and nutrition. In a framework of analysis that places exchange processes based on prices as the central phenomenon, i.e where economic outcomes are a function of market forces, productive efficiency and consumption dynamics could have divergent tendencies. In other words, in a system where the price mechanism effectively regulates resource allocation and thereby determines productive efficiency, the level (share) of consumption and its distribution may not conform to desirable standards/parameters.

It was emphasized in the earlier discussions that the particular characteristics of China–land shortage, under-employment of labour and therefore, economic and physical limits to agricultural expansion–defined the basic constraints upon the larger objectives of overall economic development. The basic challenge before the Chinese State therefore was to synthesize a development strategy that was consistent, given these structural constraints, with the requirements of rapid industrialization and adequate food availability, besides deployment of labour towards productive outcomes. The discussion in the previous chapter on the trends in agricultural production over the period 1965-78 indicated a recovery from the severe disruption during 1959-63. The gradual movement was in the direction of growth in food production per capita that surpassed the rate of growth of population leading to a rise in per capita output.

In this chapter, trends in food consumption over the period 1965-79, are examined using data from the Supply and Utilization Accounts (SUA) and Food Balance Sheets (FBS) pertaining to China, compiled by the Food and Agricultural Organization (FAO). It is however relevant to place this exercise in the particular context of China,

where entitlements to consumption (or income) were determined by the same set of principles underlying the collective institutional framework that governed production and employment. Thus households enjoyed what was known as "five guarantees" that covered food, shelter, clothing, health and education.

Section 4.1 below discusses the relationship between employment growth (generating employment for a growing labour force) and growth of food availability per capita (increasing food supplies) against the background of overall economic growth. This discussion extends the arguments raised in the previous chapter on the issue of primary accumulation or primitive socialist accumulation in the Chinese case. Section 4.2 will provide a detailed statistical evaluation of the trends in food and nutrient availability in China. SUA and FBS datasets are used to examine changes in the composition of food and nutritional status over the period 1965-78. Section 4.3 places the findings of the previous section in the specific institutional context of China. The final section 4.4 outlines some theoretical questions that emerge from rural China's development experience in the period under study.

4.1 ECONOMIC GROWTH AND THE GROWTH RATES OF EMPLOYMENT AND FOOD SUPPLY

The discussion on primary accumulation in the previous chapter examined one of the primary conditions in the case of developing countries for a successful and sustained process of industrialisation–namely the generation of economic surplus by the traditional (agricultural) sector for establishing an industrial base. While this may be interpreted as the 'capital' condition, there is another condition that can be termed as the "current" condition, which is the provision of increased food supplies–supply of wage goods-for a growing population and labour force.)

Ishikawa (1967) put forth the hypothesis that given the initial economic conditions of Asian developing countries, the potential rate of economic growth is likely to lag behind the minimum rate required for economic development. Assuming that the role of the external sector is marginal to the process of development, there arises a conflict between two simultaneous objectives:

1. That of providing employment to both the additions to the labour force as well as the excess labour that already exists and

2. Of increasing agricultural production to the extent of not only meeting the food (wage good) requirements of a growing population but also a substantial surplus to meet the needs of industrialisation.

In other words, while the achievement of the first objective requires a fast rate of industrialisation it creates a bottleneck for additional food production that is essential. Moreover, a higher rate of industrialisation is likely to deprive the agricultural sector of investment funds that is required to meet the second objective. If the quantum of investible funds deployed for industrial development over a period of time reduces the share that would be required for flood control, irrigation and other rural capital inputs, agricultural growth would tend to be lower than potentially possible. Either way the trade-off between agriculture and industry for investment funds in combination with the objective of providing employment tends to result in a lower overall growth rate than that required for sustained and balanced economic development.[1]

We noted earlier Lippit's (1974) estimates of the economic surplus that was released from unproductive forms like rent and moneylender interest, following the initial radical land reforms which abolished landlordism and distributed resources on an egalitarian basis[2]. This was only a one-time recouping of surplus from agriculture, whose contribution was significant, with over half being absorbed by the state through taxes and terms of trade. Owing to the radical re-organisation of production relations in agriculture the incomes of the hitherto poor, freed from the burden of paying rent and interest, improved. But increasing the economic surplus further, required investment especially in irrigation, which being a lumpy non-divisible investment (unlike seed or fertilisers) was still beyond the capacity of an individual household. It was the pooling of first, the peasant investible funds and then their assets through co-operation, (which has been elaborated upon earlier), that made possible a high rate of accumulation-an average of 30 per cent of national income. Consequently, low shares in national income of consumption, manifested itself in the expansion of consumption goods. This ultimately translated into an accumulation of household savings that were additionally available for national investment funds. Ghose (1984) notes that, the relatively slow growth of consumption can be viewed as a necessity imposed by the slow growth of crop production, relative to that of population rather than as a result of deliberate policy for two reasons. First, when supplies of basic necessities are limited and inelastic, a reduction in income inequalities leads to a rise in the rate of accumulation and hence to accelerated rates of growth of national income and consumption. Secondly, the tendency of consumption to grow at a rate

1 An elaborate discussion of the required and the potential growth rate is presented in section 4, Chapter 1, along with a structural growth model in Appendix 1A in Ishikawa (1967: 30-45 and 46-56) respectively.

2 China did receive aid in the form of machinery and technological know-how from the Soviet Union and East European countries for a decade during 1949-59, but in comparison to the quantum of accumulation, it was not very significant - about 2 per cent of the total state revenue. See Dong Fureng (1983: 83-84).

lower than the national income in China arose as a consequence of direct constraints on consumption growth[3].

Ishikawas's (1967) hypothesis is examined in a slightly different manner in Saith (1985) in the form of the dynamics of employment growth and increasing food availability during early industrialisation[4]. Using an illustrative model, the desirable growth rates of both employment and of food output are determined, such that the overall economic growth is sustainable or balanced. Given a certain rate of population growth and therefore growth of labour force, the employment elasticities in the food production sector and the industrial (non-food) sector, determine their respective capacities of labour absorption–assuming certain capital labour ratios. If the entire addition to the labour force was to be absorbed and at the same time if the food consumption per capita was to be maintained at levels that provide adequate nutrition (or if they are initially higher, then at least at previous levels) these two sectors would need to grow at certain rates to satisfy both the conditions. Thus, in this model, employment 'balance' (or condition) requires an overall growth rate that can absorb the net additions to the labour force and food 'balance' (or condition) requires that the rate of growth of food production can at least feed the additional population at previous levels of nutrition. For the sake of simplicity it is assumed per capita nutritional levels are not already below the threshold level that meets minimum requirements. This condition becomes more demanding when increases in per capita incomes lead to increased demand for food (i.e. either income elasticity of food is constant or rising).

In this model therefore, a violation of the employment condition results in a higher number of dependents per employed person, implying an equitable sharing of limited employment opportunities (or under-employment and unemployment). Within a socialist framework with universal entitlement to work, redistributive mechanisms operate to distribute equitably available benefits of employment between the employed and the unemployed, though slightly biased in favour of the former. When the condition with regard to food is violated, the equity principle again operates viz. the sharing of hunger. In a capitalist economy however, imbalance with regard to employment leaves the unemployed without any means, unless social security mechanisms operate to alleviate the situation. Furthermore, if food availability is insufficient it leads to a rise in food prices, which given the inequality of distribution

3 Ghose also notes that this is a rather general phenomenon, because in non-socialist economies, growing inequalities tend to reduce aggregate income elasticity of consumption.

4 Though, this examination is placed in the context of primitive accumulation in socialist systems, the issue is relevant for other developing countries in their early stages of industrialization. For the formal model see Saith (1985: 9-10).

of income and entitlements, deprives the poor of adequate nutrition. "Thus in a poor capitalist economy, the growth of the economy especially the non-food sector, is financed partly through the creation of hunger"[5].

Using empirical evidence from 55 poorest countries[6], Saith (1985) concludes that during the period 1970-81, in only 14 countries, growth of per capita food production was higher than that of population and in only three countries, both the conditions were met.[7] Comparing the experience of developing countries within this illustrative framework three conclusions are drawn:

1. Only in exceptional cases, both the balances are maintained;
2. In the majority of the cases, the experience with regard to overall growth and employment has been better than that of the food sector–imbalanced growth; and
3. In an overwhelming number of cases, the food balance has been grossly violated.

Saith further argues that even when these balances are met, there may be other mechanisms which may lead to a violation of the conditions at a more disaggregated level of analysis. Lastly, even with a positive rate of growth of output per caput in aggregate terms, both the balances may be violated[8].

In the case of China, it may be argued that the relationship between employment growth and the growth of food supply were not simultaneously determined as predicted by the formal model that Saith presented. In other words, the two balances need neither be independent nor in conflict. The specificity in the Chinese case was a deliberate linking of fuller deployment of the under-employed with investment, through labour mobilisation for capital construction that indirectly leads to output growth. But this was crucially dependent on the collective structure of organisation of production that guaranteed minimum needs under a system of deferred income. While it is true that employment elasticity of output, given a certain output-labour ratio would determine the level of employment and therefore unemployment, the effects may be moderated in a completely different manner within a system of collective institutions by. In fact, as elaborated in previous two chapters (Tables 3.2a, 3.2b & 3.2c) employment was rapidly raised in terms of days employed per worker

5 Saith (1985: 12).

6 The data used is from the World Bank's *World Development Report*, 1984

7 These were Philippines, Thailand and Sri Lanka.

8 As Saith (1985: 11) notes, "Indeed, high per capita growth rates are more likely to be characterised by food imbalances than not".

along with an increase in participation rates, with work deliberately guided to forms that raised land productivity while restraining premature rise in labour productivity.

The slower than required rate of growth of food production was above all owing to the limits expanding cultivable area, which could potentially violate food balance. However, this was moderated through mechanisms and policies that were central to distribution of income and food. Further, as long as efficiency considerations are guided by the principle of productive deployment of labour, additional labour could generate positive additions to output (below what could be potential additions). Given the choice of a variety of technologies with varying capital-labour ratios (as was the case with rural industrialization), the net effect was creation of employment rather than a violation of the employment balance.

In the next section (4.2), trends in food availability and in nutrition for the period 1965-78 are examined. This is followed by a discussion on the egalitarian and income equalising tendencies that were built into the collective institutional processes that restricted the more serious distributional consequences in the sphere of food availability that afflict many developing countries in section 4.3.

4.2TRENDS IN FOOD AVAILABILITY AND NUTRITION IN THE 1960S AND THE 1970S

Piazza (1983) is one of the few detailed studies on trends in food production and nutrition for the period 1950-81. Earlier studies on food consumption in China relied on very limited data and provided only a general picture[9]. Piazza (1983) is however, based on a comprehensive survey of datasets, that are largely drawn from official sources and are rigorously evaluated. As regards food grains, for the entire thirty-one years, complete time series data are available only for the production of total grains, rice, wheat and aquatic products[10]. Selected years data are available for all the other commodities except pulses and vegetables, poultry, other meat, eggs and animal feed. However, sown areas for most crops, besides numbers of livestock of various categories, make it possible to estimate production figures providing a reasonable basis to evaluate trends in nutrition. According to the estimates, data on production of pulses is derived by subtracting available data on barley and oats from the category “other grains”. The estimated data places the share of pulses in “other grains” to be of the order of 10 per cent during 1950-56, 12 per cent during 1958-62,

9 For a survey of earlier studies, see Smil (1980).

10 Piazza (1983: 3), notes that production figures for grains other than rice and wheat were reported for only 9 out of 32 years (1950-81). The details of the availability of data on production for various food commodities for various years are presented in Table 1 (Annex 2 page 3).

10 per cent for 1963-69, 6 per cent for 1971-75 and 55 for the year 1978. As regards oilseeds production, it is estimated that inedible oil that includes linseed and castor oil besides minor quantities of other oilseeds, accounted for about 7 per cent of the official data on total oilseeds production. Data on sugar production is available only for the year 1977 and therefore all estimates of sugar are derived from assumed extraction rates for sugarcane and sugar beet. Similarly, vegetable production is derived from data on sown area and yields for the year 1957, adjusted for other years by assuming an annual growth of 2 per cent.

As regards production data for animal products (largely meat and poultry) Piazza (1983) notes that "the time series for most of the seven animal commodities are unreliable, available either for selected years or completely unavailable". However, the data for aquatic products is judged to be reliable. Similar to the case with food crops where sown area data is available for all years from which, based on reasonable assumptions regarding yields, total production can be derived, in the case of meat production, livestock numbers are available for all years. Also available are slaughter rates and average live animal weights as well as dressed weights (carcass dressing percentages) for pork, beef and mutton. This enables derivation of production data for these categories of meat. Since pork comprises roughly 90 per cent of total red meat consumption, the slaughter rates of cattle at 5-10 per cent is consistent with the functional role of these animals as draught power. The slaughter rate assumed for sheep and goats is 30 per cent. Data least available in the category of animal sources of food is poultry and eggs, as they were under private sideline production at the household level since the early 1960s.

Data on the populations of live animals of various categories makes it possible to construct the volumes of food commodities (grains, byproducts from grain and oilseeds, vegetable and vegetable waste) diverted as feed. Since the livestock model in China (at least until the early 1980s) is one that is closely integrated with agriculture (i.e. not operating as a separate industry) much of the byproducts of farming are utilized in the provision as feed thereby reducing demand for feed grains[11].

Though estimations suffer from biases in either direction, Piazza notes that the derived data as well as officially reported data on production of most food items, "appear to be reasonably accurate and consistent"[12]. FAO's Food Balance Sheets data on trade and manufactured food, expressed in terms of processed output

11 In the Chinese classification of animal feeds and feed concentrates are composed of grain, grain millings and other byproducts such as oilseed cake, besides more importantly forage or roughage. See Piazza (1983: 17-23 Annex 2) for a detailed discussion on the estimations of food diverted towards feed based on the integrated livestock model and the feed concentrate compositions for various years.

12 Ibid (p2)

for rice or flour or other grains such as maize and wheat, are converted to their unprocessed equivalent weight. Disappearance of food through wastage during transport, storage and processing or alternative end uses are approximated while constructing FBSs. Much of the diversion of food is accounted for portions inedible for human consumption, but a significant part of this is directly available as animal feed–for example, the assumed proportion for rice husk is 12 per cent. Rice extraction coefficient for China is assumed at 67 per cent, seed use at 3 per cent, and about 7-11 per cent as animal feed. Estimates of population may be under-reported by 5-6 per cent[13].

While the assumptions regarding the proportions of various components of disappearance of each category of food–wastage, feed, extraction coefficients etc–pose problems in deriving quantities that are residually available as direct food, there is another set of problem that emerges while estimating nutritional levels from food quantities. This is due to the wide variation in the nutrient content of various varieties and grades of the same item of food–say rice or wheat. Piazza notes that in the official Chinese manual on food composition and nutrition (Tables on food Composition)[14] the energy availability from over 28 varieties of rice ranges between 3300 Kcal/kg and3730 Kcal/kg-the dispersion being much larger as regards the 'yields' of protein and fat per unit.[15]The exercise therefore is a complex one.

4.2A Food Balances–Conceptual and Empirical Issues

Piazza's (1983) statistical exercise is based on FAO data (from which annual Food Balance Sheets (FBS) are compiled for the period 1950-81) as well as on official data published in the early 1980s and on datasets compiled by USDA relating to China's agriculture. In this section, some of the conceptual aspects and assumptions underlying the statistical exercises are taken up for discussion.

According to the FAO description, FBSs "present a comprehensive picture of the pattern of a country's food supply during a specified reference period. The food balance sheet shows for each food item-i.e. each primary commodity and a number of processed commodities potentially available for human consumption-the sources of supply and its utilization. The total quantity of food items produced in a country added to the total quantity imported and adjusted to any change in stocks that

13 See Piazza (1983: 6). Adopting the model used in Dawson (1970: 178-185), Piazza estimates that roughly 30 per cent of domestic food supply is diverted away from human consumption – 40 per cent of which (12 per cent of total) is inedible portions, in the case of rice as husk.

14 *Tables on Food Composition*, (1982) (in Chinese), People's Public Health Publications, Beijing.

15 Piazza (1982: 6). Protein content varies between 47g and 139 g and fat from 3g to 93g for every kilogram of rice across the 28 rice varieties.

may have occurred since the beginning of the reference period, gives the *supply* available during that period. On the *utilization* side a distinction is made between the quantities exported, fed to livestock, used for seed, processed for food use and non-food uses, lost during storage and transportation, and food supplies available for human consumption at the retail level, i.e. as the food leaves the retail shop or otherwise enters the household. The *per caput* supply of each such food item available for human consumption is then obtained by dividing the respective quantity by the related data on the population actually partaking of it (including foreign nationals residing and excluding domestic population residing abroad). Data on *per caput* food supplies are expressed in terms of quantity and-by applying appropriate food conversion factors for all primary and processed products-also in terms of energy, protein and fat."[16]

While FBS provides a comprehensive picture of the pattern of a country's food supply, there are some gaps between the theoretical and conceptual basis on which FBS are constructed and the practical aspects of collecting and compiling them. Besides this, FBS report food consumption from a food supply perspective and neither takes into account the differences in the composition of diets of various population groups, nor seasonal variations in supplies. Food consumption surveys would be more relevant for analytical purposes. There are also conceptual problems that include coverage /representativeness of data–production figures include only commercial production of major crops and exclude production for subsistence or that part of production that is self-consumed by producers. Further, under the category of manufactured food, only enterprises above a certain size are included in surveys and therefore tend to be underestimated as would be the case with stocks, which would exclude those held by households (both producer and only consumer households), catering establishments and institutions.

Piazza (1983) uses a different method to arrive at the components of feed and waste than that compiled by the FAO[17]. This is formally elaborated in the next section and relates essentially to the integrated nature of crop cultivation (farming) and animal husbandry. In most developing countries, and more so during the period under consideration in China, crop residues-rice husks, bran and other byproducts of milling besides dried stalks–are almost entirely utilized in the production of feed concentrates[18], thereby lowering the requirements of processed grain (as well as

16 FAO (2001: 2,3)

17 This is probably owing to non-availability of data on these components at that time, as it is with a lag of a few years that FAO finalizes the Food Balance Sheets.

18 Besides, other uses included to a limited extent preparation of organic manure as well as combustible material (stalks) for both household use and in local manufacturing units such as brick making or ceramics.

other processed food commodity outputs, vegetables, pulses, oilseeds) for the same purpose. Therefore, in estimating the diversion of food crop outputs towards feed, production in terms of unprocessed quantities take on a greater relevance than manufactured feed.

4.2B Food Disappearance–Supply and Utilization

The food disappearance identity is essentially a complete account of the various uses to which the total amount of food produced is put to and the one used by the FAO takes the form of supply equaling utilization and is presented as annual datasets for each country in the form of Supply and Utilization Accounts (SUA). In these datasets, for each item within the various categories of foods such as cereals, tubers, oilseeds, sugar, fruits, vegetables, other vegetal food products, meats, poultry and aquatic products-domestic supply (DS) comprises domestic production (DP), exports, imports and change in stocks. On the utilization front, food disappearance takes the form of seed, feed, non-food manufacture, waste and finally, as food.

Piazza however, uses a slightly varied form where the production figures for various food items are in unprocessed form. Thus for commodity "i" in year "j", food disappearance as other than food can be expressed as

$$\{(DP_{ij})\ (s_i) + (DS_{ij})\ (f_i + n_i + w_i)\} + [((DS_{ij}) - \{(DP_{ij})\ (s_i) + (DS_{ij})\ (f_i + n_i + w_i)\})\ (p_i)].$$

Here, the sum of seed use (s being its proportion in DP), other non-food disappearances in the form of feed, non-food uses and waste (f, n, & w respectively denoting their proportions in DS) and a residual, where p_i denotes the extraction losses for item "i". The other food disappearances include, feed, non-food manufacture and waste. Expressed in another manner, Food Disappearance (FD) is the sum of food and non-food uses, where non-food uses include seed, feed, non-food uses and waste.

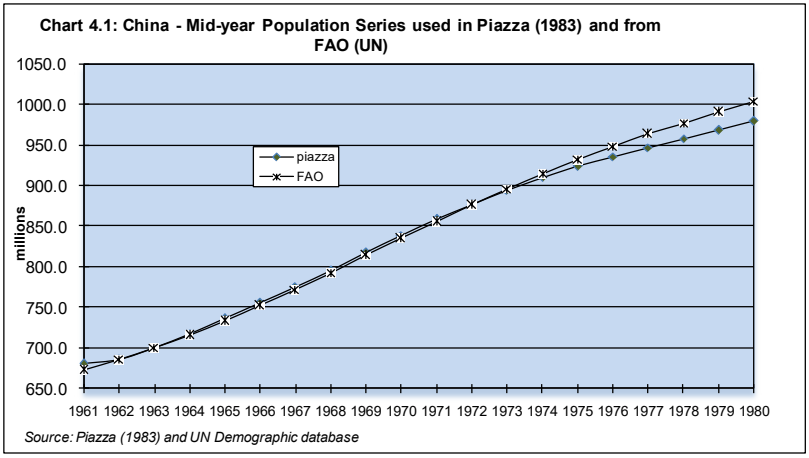
$$FD = F + nF$$

$$nF = (s + f + n + w)\ P$$

$$FD = (s + f + n + w)\ P + (DS - ((s + f + n + w)) * e$$

F and nF denote food and non-food uses respectively, P denotes total food production in unprocessed terms, and 'e' denotes extraction rate. Food available for human consumption therefore is derived as the extractable share of the residual after deducting non-food uses (including waste) from Domestic Supply.

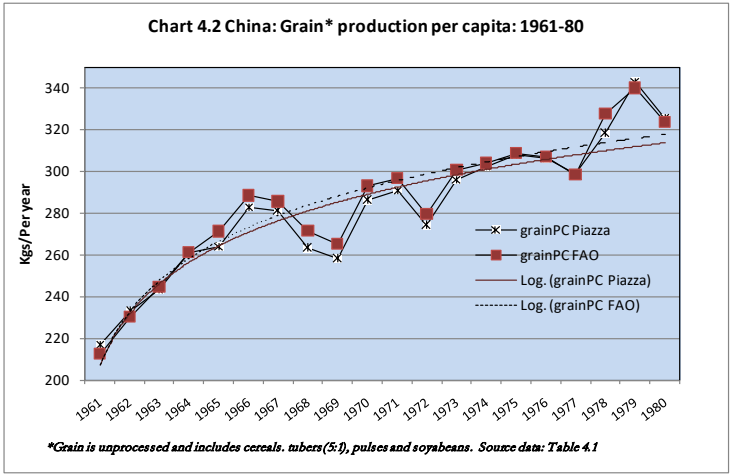
The Food Balance Sheets constructed in Piazza (1983) provide per capita availability of 21 food commodities (only 15 or 16 for some years) for the period 1950-81. These include seven commodities that are of animal origin and the rest are vegetal products. The per capita daily nutrient availability in terms of energy (carbohydrate equivalent in kilocalories), protein and fat from these food commodities is derived using standardized food conversion rates[19].



A comparative exercise of the average per capita energy and nutrient supplies derived by Piazza and those estimated in this work from the FAO-SUA datasets is undertaken in the next section. It is however, relevant to note here that the production figures of fine grains, coarse cereals and therefore total grains in both the exercises do not vary significantly for almost every year. But, the mid-year population series to estimate per capita availability varies slightly until the early 1970s with the Piazza series only marginally higher and the variations become significant after 1973 with the difference (lower FAO to UN figures) amounting to almost 20 million by 1978 Chart 4.1). This may not be due of rounding up to the same comparable unit (millions used in Piazza and thousands in the FAO dataset). The comparative data in this regard is presented in Table A4.1. Chart 4.2 maps the per capita (total) grain production estimates of Piazza and from the FAO-SUA dataset. Grains as an aggregate category used here follows the definition used in Piazza (1983) which is also the Chinese official definition and includes, fine grains such as rice and wheat, coarse grains such as maize, millets, rye, sorghum, and other minor grains as well as soybeans, pulses and starchy roots (estimated at 1/5th harvested weight as dry equivalent).

19 Piazza uses the conversion rates in FAO (1968) *The Composition of Some East Asian Foods,* FAO and US Department of Health Education and Welfare, Rome.

Total production is different by definition from domestic supply as the latter includes net imports and changes in stocks. In Appendix Tables A4.2a (end of the chapter) through to A4.2d, data on production and domestic supply for various food categories are presented. The first two of these tables relate to vegetal products–all major food crops (Table A4.2a) and all categories of cereals (Table A4.2b) while the other two present data on animal products–meat categories (Table A4.2c) and milk, eggs and aquatic products. Two interesting observations can be made from these 4 tables. As regards vegetal products, the trade component in domestic supply is insignificant. In the case of animal sources of food, only in the case of milk and aquatic products, net imports assume significance. Net imports of milk as a share of domestic supply increased from over 5 per cent during the mid-1960s to over 10 per cent in 1970 and over 20 per cent by 1978. The quantum of domestic supply rose by 150 per cent between 1964 and 1978. As regards aquatic products, the net import share in domestic supply was insignificant until 1974 (with a maximum import share of 4.4 per cent in 1969) but was over 7 per cent by 1978. It must however, be emphasized here that except for pork, per capita availability of all other animal products were small.



Domestic supply as a category is significant to evaluate food consumption, but even this does not entirely represent what is available for consumption. The latter–that part of Domestic supply available as food–is estimated after excluding diversion towards other uses such as seed, feed, food manufacturing as well as waste. Production data indicate only total output. The utilization rates as a proportion of domestic supply of each food commodity towards seed, feed, waste, food manufacture and other uses are based on a variety of factors. These are taken up for discussion below.

SEED: The proportion set aside as seed not only depends on the prospective acreage in the next cropping cycle but also on certain historical (traditional) practices to meet contingencies arising out of risk factors that may affect the next harvest (seed saving). Piazza (1983) uses a combination of FAO figures and "fragmentary" data from two World Bank Agricultural projects on North China Plain and Hebei[20]. Tables 4.3a and 4.3b respectively present FAO estimates of seed as a proportion of production and the (assumed) amounts of seed per hectare sown in the succeeding year for various categories of food and for some cereals. Figures in the latter table remain roughly constant over the period 1962-79, whereas in the former, the proportions consistently fall over the period. In retrospect however, in the case of wheat and soybeans to some extent, the constant seed per hectare assumed in the FAO dataset results in very high proportions allocated as seed during the early 1960s, given that there was a gradual but consistent expansion in the sown areas of cereals and the gains in yields were higher. As noted in the previous chapter, with renewed efforts to stabilizing agriculture since the 1960s, seed and yield improvements received considerable policy initiatives that led to major breakthroughs in high yielding cereal varieties (initially rice) in the second half of the 1960s.

Waste, food Manufacture and Other Uses (Table 4.2): These three components of utilization of food commodities are discussed together, as they account for a small proportion of total domestic supply. The exceptions however are soybeans and potatoes, which have higher shares owing largely to diversion towards food manufacturing. In the case of cassava, the share diverted to non-food uses was significant–around 7 per cent in the early 1960s but falling to roughly half those levels by 1979. The manufacture of tofu–soybean curd–is not only an important food manufacturing activity, but also a (culturally and historically) significant source of protein and fat. From the mid-1960s to early 1970s, the share in domestic supply of soybeans used for food manufacturing remained around 30 per cent, but began to rise significantly in the second half of the 1970s to 40 per cent. It is also significant to note that from 1970 onwards, the direction of trade in soybeans changed from one of net exports to net imports and by the end of the 1970s, the share of net imports in domestic supply was over 15 per cent. In the case of potatoes, the growth in absolute quantities in food manufacture was steady, rising from less than a million tons in 1964 and 1965 to over 2 million tons since 1975. The share in domestic supply was in the range of 5-7 per cent until the mid-1970s, reaching almost 10 per cent in 1975.

20 See Piazza (1983: 17 Annex 2) and the figures for the year 1979 reported in Table 11, Annex 2, (p 18). The exact proportions or quantities estimated are not mentioned in any part of the work. The two World Bank Project reports cited under Table 11, Page 18 are (a) *Staff Appraisal Report, 'China: North China Plain Agricultural Project'* (Report No. 3815-CHA, May 26, 1982. Projects Dept., RUP), pp. 65 and 67 and (b)*Staff Appraisal Report, 'China. Hebei Agricultural Development Project'* (Report No. 3855-CHA, May 17, 1982, Projects Dept., RAP).pp. 67 and 69.

Table 4.2: China: Diversion of Major Food Commodities as Waste, Non-food Uses and Food Manufacturing, 1964-80

	'644	'65	'66	'67	'68	'69	'70	'71	'72	'73	'74	'75	'76	'77	'78	'79	'80
Waste as a Share of Domestic Supply (%)																	
Cereals	5.1	5.1	5.1	5.3	5.1	5.0	5.0	5.0	5.1	5.1	5.0	5.0	5.0	4.6	4.7	4.8	4.8
Wheat	5.7	5.7	5.9	5.5	5.0	5.0	5.4	4.9	5.7	5.7	5.6	5.7	5.4	4.3	4.9	5.3	5.6
Rice(ME)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Maize	5.2	5.6	5.0	6.4	6.1	5.6	5.3	5.7	5.5	5.1	4.9	4.9	4.9	4.8	4.5	4.3	4.1
Soyabeans	3.4	2.8	2.9	3.0	2.8	2.9	2.9	3.0	2.4	2.6	3.1	2.6	2.5	2.7	3.0	2.7	2.8
Barley	4.8	5.1	4.8	4.8	4.7	4.7	4.5	4.4	4.3	4.5	4.6	4.6	4.5	4.5	4.5	4.8	4.4
Rye	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.8	4.8	4.8	4.8	4.9	4.9	4.7	4.7	4.8	4.8
Oats	4.4	4.4	4.5	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.7	4.5	4.6	4.7
Millet	5.1	4.9	5.1	5.0	4.8	4.8	5.1	5.0	4.8	4.8	5.1	4.8	4.8	4.8	5.0	4.8	4.8
Sorghum	5.1	4.8	5.1	4.9	4.8	4.8	4.9	4.9	4.8	4.7	4.7	4.7	4.8	4.5	4.5	4.3	4.4
Oth. Cereals	4.7	4.6	4.7	4.7	4.6	4.7	4.7	4.7	4.7	4.6	4.7	4.7	4.6	4.5	4.6	4.7	4.7
All Tubers	5.2	5.2	5.1	5.2	5.0	5.2	5.1	5.1	5.1	5.3	5.1	5.1	5.1	5.0	5.0	5.0	5.0
Cassava	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.2	3.2	3.2	3.3	3.2	3.3	3.2	3.1	3.2	4.1
Potatoes	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Sw. Potatoes	5.3	5.2	5.2	5.2	5.0	5.3	5.2	5.2	5.2	5.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Oth. Roots	5.1	5.1	5.1	5.0	5.0	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.9	5.0	4.9	4.9
Pulses	3.1	3.2	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Oilcrops	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	2.9	2.9	3.2	2.9	2.8	2.9	3.1	3.1	3.1
Other Uses (non-food) as a Share of Domestic Supply (%)																	
Cereals	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.3	0.3	0.3	0.3
Oilcrops	4.8	5.5	4.5	4.6	4.8	4.3	4.7	5.7	6.7	5.5	5.1	5.3	5.4	5.2	4.8	4.9	4.2
Cassava	7.3	7.1	7.3	6.8	6.9	7.0	6.1	5.3	5.3	5.0	5.4	4.9	4.5	4.5	3.9	3.2	8.1
Maize	1.1	1.1	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.9	0.8	0.9	1.0	0.9
Food Manufacture as a Share of Domestic Supply (%)																	
Cereals	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.5	0.5
Soyabeans	28.7	31.5	29.2	29.8	29.7	31.9	32.7	30.9	32.7	29.7	33.8	35.7	35.8	38.1	39.9	40.8	41.5
Barley	0.5	0.6	0.8	1.1	1.5	1.9	1.8	1.9	2.0	2.5	2.2	2.6	2.8	3.2	3.4	3.8	5.7
Potatoes	6.1	5.0	6.8	5.6	7.2	7.3	6.1	6.8	6.6	6.6	7.4	9.9	13.4	8.2	7.6	9.4	13.9

Source Data: FAO, Supply and Utilization Accounts database. Rice (ME) refers to Milled equivalent

Waste as a share of domestic supply remained steady around 5 per cent for all cereals and tubers with lower figures of around 3 per cent in the case of pulses and oil crops. These shares are in effect estimations based on certain assumptions in the FAO datasets and though the shares remain steady given considerable expansion in output over the period, they account for annually increasing quantum of losses. It may also be noted here that part of the losses–particularly those that arise during processing–actually enters into the category of feed, as a large proportion of crop residues and by-products of processing are used in the preparation of feed concentrate. This issue is taken up below.

FEED: As Piazza (1983:17-23 Annex2) notes China's livestock formed an integral part of the agricultural system, supplying predominantly draft power and manure besides meat and other food products. A substantial share of total meat (mainly pork) and poultry production was undertaken at the household level since the mid-1960s, when private plots for vegetable growing and raising small livestock were permitted. Piazza (1983) also undertakes a detailed empirical evaluation of the livestock feed requirements by estimating the shares of food grains and oilseeds besides other food commodities that formed part of "feed concentrates". The significance of using un-milled grain (particularly paddy rice) in the food balances equation is precisely to account more accurately the quantum of feed that would be available. The extraction rates pertaining to grain, edible oil and sugar depends on the technology used, the degree of refinement of the final product as well as the quality of the unprocessed food item. [21]

The livestock feed model here thus takes into account some part of crop residues, a large proportion of grain millings as well as oilseed cakes, besides food that may not be suitable for human consumption in estimating the total amount of feed that is already available excluding what can be accounted as food. Annual feed requirements are estimated, consistent with the populations of various forms of livestock in combination with their bodyweight to feed requirements. The difference in feed requirements and availability determines the amount of food commodities that would need to be diverted towards feed.

Table 4.3a: Share in Domestic Supply Diverted to Feed, 1961-80 Various Cereals (proportions)

	All Cereals	Wheat	Rice	Barley	Maize	Rye	Oats	Millet	Sorghum	oth. cereals
1961	0.03	0.00	0.00	0.02	0.11	0.18	0.17	0.04	0.03	0.07
1962	0.04	0.00	0.00	0.03	0.13	0.18	0.48	0.05	0.05	0.06
1963	0.07	0.02	0.00	0.04	0.28	0.16	0.44	0.07	0.09	0.06
1964	0.08	0.03	0.00	0.04	0.32	0.15	0.47	0.07	0.10	0.00
1965	0.08	0.04	0.00	0.03	0.33	0.16	0.48	0.07	0.10	0.06
1966	0.10	0.03	0.00	0.04	0.39	0.16	0.37	0.09	0.11	0.06
1967	0.11	0.03	0.01	0.04	0.40	0.18	0.49	0.10	0.12	0.07
1968	0.11	0.02	0.01	0.06	0.41	0.12	0.41	0.11	0.13	0.09

21 The FAO estimate of extraction rate for rice is at 66.7 per cent on average. Piazza (1983) uses 67 per cent for rice, 91 per cent and 85 per cent for maize and wheat respectively besides 80 per cent for millet and sorghum. In the case of vegetable oils, official Chinese data appears consistent with oilseeds production and reasonable extraction rates. The data for sugar production is not officially available for all years and are therefore estimates based on production of sugar crops, and extrapolated extraction rates from other years.

	All Cereals	Wheat	Rice	Barley	Maize	Rye	Oats	Millet	Sorghum	oth. cereals
1969	0.12	0.03	0.01	0.06	0.41	0.12	0.35	0.10	0.14	0.09
1970	0.12	0.03	0.01	0.12	0.43	0.16	0.38	0.09	0.15	0.09
1971	0.11	0.03	0.01	0.13	0.42	0.09	0.32	0.09	0.15	0.10
1972	0.12	0.04	0.01	0.15	0.44	0.09	0.39	0.11	0.17	0.11
1973	0.14	0.03	0.01	0.09	0.49	0.10	0.38	0.11	0.19	0.11
1974	0.14	0.03	0.01	0.09	0.50	0.12	0.30	0.12	0.19	0.11
1975	0.16	0.03	0.01	0.08	0.52	0.15	0.28	0.13	0.22	0.11
1976	0.16	0.03	0.01	0.11	0.52	0.17	0.25	0.14	0.25	0.12
1977	0.15	0.02	0.02	0.10	0.50	0.12	0.21	0.16	0.30	0.17
1978	0.17	0.02	0.02	0.10	0.53	0.16	0.36	0.16	0.35	0.14
1979	0.17	0.02	0.01	0.16	0.53	0.15	0.33	0.15	0.35	0.13
1980	0.17	0.03	0.02	0.14	0.54	0.08	0.17	0.16	0.33	0.15

Source Data: Supply and Utilizations Datasets, FAO

Table 4.3b: Shares of Various Cereals in Total Cereals Diverted to Feed, 1961-80 %

	Wheat	Rice	Fine Grains	Barley	Maize	Rye	Oats	Millet	Sorghum	Other Cereals	Coarse Grains
1961	0.00	2.83	2.83	2.96	62.30	7.83	6.17	8.65	6.18	3.09	97.17
1962	0.00	2.19	2.19	4.03	54.66	7.71	14.40	7.30	7.28	2.43	97.81
1963	5.33	2.21	7.54	2.35	68.10	2.45	5.78	5.18	7.55	1.05	92.46
1964	7.99	2.20	10.18	1.75	69.34	1.91	5.55	4.60	6.66	0.01	89.82
1965	11.15	2.43	13.58	1.32	66.55	2.08	5.13	4.01	6.46	0.86	86.42
1966	5.85	2.21	8.06	0.92	74.21	1.48	2.65	5.23	6.74	0.71	91.94
1967	5.88	2.27	8.15	0.68	73.86	1.44	3.08	5.45	6.61	0.72	91.85
1968	3.97	2.64	6.61	0.90	75.86	0.79	2.03	5.99	6.99	0.82	93.39
1969	4.84	2.85	7.69	0.84	76.14	0.88	1.60	5.21	6.80	0.85	92.31
1970	5.26	3.91	9.17	1.73	74.16	1.08	1.84	4.28	6.82	0.92	90.83
1971	4.90	4.60	9.50	2.08	74.17	0.58	1.47	4.40	6.79	1.01	90.50
1972	7.22	4.41	11.63	2.24	72.68	0.56	1.63	3.73	6.52	1.02	88.37
1973	5.57	4.41	9.99	1.04	76.34	0.53	1.23	3.15	6.76	0.96	90.01
1974	4.44	4.09	8.52	1.01	79.12	0.60	0.96	3.01	5.80	0.99	91.48
1975	4.84	3.75	8.59	0.80	79.71	0.69	0.78	2.60	5.90	0.94	91.41
1976	4.22	3.85	8.07	1.11	79.39	0.77	0.70	2.61	6.37	0.99	91.93
1977	3.18	4.07	7.24	0.98	78.91	0.48	0.46	2.88	7.97	1.07	92.76
1978	3.18	3.59	6.77	0.91	80.05	0.67	0.79	2.52	7.34	0.96	93.23
1979	3.48	3.37	6.85	1.48	80.25	0.65	0.72	2.23	6.90	0.92	93.15
1980	4.21	3.48	7.69	1.17	82.22	0.26	0.35	2.05	5.51	0.76	92.31

Rice and wheat are fine grains and the rest are coarse grains

Source Data: Supply and Utilizations Datasets, FAO

Table 4.3c: Share of Feed in Domestic Supply, 1961-80 Soyabeans and Oilcrops, 1961-80 (Proportions)

	Oilcrops	Soybeans	Cottonseed	Other Oilcrops
1961	0.04	0.03	0.10	0.03
1962	0.04	0.03	0.10	0.03
1963	0.05	0.03	0.14	0.03
1964	0.07	0.04	0.19	0.03
1965	0.08	0.04	0.22	0.04
1966	0.09	0.04	0.25	0.04
1967	0.09	0.04	0.25	0.04
1968	0.09	0.03	0.25	0.04
1969	0.08	0.03	0.24	0.04
1970	0.08	0.03	0.24	0.04
1971	0.07	0.03	0.22	0.04
1972	0.06	0.03	0.19	0.04
1973	0.09	0.03	0.26	0.04
1974	0.09	0.03	0.26	0.05
1975	0.08	0.03	0.25	0.05
1976	0.07	0.03	0.20	0.06
1977	0.07	0.03	0.20	0.04
1978	0.06	0.03	0.22	0.04
1979	0.06	0.03	0.21	0.05
1980	0.07	0.03	0.25	0.05

Source Data: Supply and Utilizations Datasets, FAO

Table 4.3d: Calorific Equivalent of Various Food Commodities Diverted to Feed, 1961-80, Kcal. Pc Per Day

	Cereals	Tubers	Pulses	Oilcrops	Total
1961	37.52	38.25	2.09	5.01	82.87
1962	45.13	56.00	3.39	5.00	109.51
1963	95.31	57.53	7.23	7.77	167.84
1964	113.80	66.99	5.87	12.05	198.72
1965	123.39	68.68	6.66	14.96	213.69
1966	148.12	76.63	4.63	18.95	248.32
1967	162.96	79.22	5.86	17.67	265.71
1968	163.39	80.72	6.16	17.17	267.44
1969	172.11	79.04	6.21	14.26	271.63
1970	185.03	95.07	7.02	15.01	302.13
1971	182.51	85.23	7.25	12.90	287.89
1972	194.11	78.15	7.11	10.05	289.43
1973	231.25	111.86	7.54	16.01	366.67
1974	246.54	104.38	7.89	15.94	374.75
1975	272.47	96.41	7.95	13.81	390.63
1976	277.56	90.07	7.71	10.05	385.39
1977	271.99	105.52	8.02	10.56	396.08
1978	320.10	116.72	8.63	11.37	456.81
1979	334.21	111.16	9.37	11.94	466.67
1980	348.58	111.22	9.61	16.03	485.44

Estimated from FAO SUA and FBS

Table 4.3e: China–Nutrition Per Capita From Vegetal and Animal Sources, 1961-80

	Carbohydrates Calories Per Day			Protein, Grams Per Day			Fat, Grams Per Day		
	Total	Vegetal	Animal	Total	Vegetal	Animal	Total	Vegetal	Animal
1961	1641	1584	57	42.7	39.1	3.5	15.1	10.7	4.4
1962	1725	1659	66	45.4	41.2	4.1	16.2	11	5.2
1963	1785	1694	91	46.3	41.4	4.9	19.2	11.7	7.5
1964	1852	1745	108	47.9	42.5	5.4	21.8	12.6	9.2
1965	1972	1855	117	49.2	43.4	5.8	22.9	12.9	10
1966	2045	1923	122	50.2	44.2	6	24.2	13.7	10.5
1967	1983	1858	125	48.8	42.7	6	24.4	13.6	10.8
1968	1934	1812	121	47	41.1	5.9	23.4	13	10.4
1969	1913	1797	116	45.8	40.1	5.7	22.7	12.8	10
1970	2026	1913	113	47.9	42.3	5.5	23.3	13.6	9.8
1971	2041	1916	125	48.7	42.7	6	24.4	13.6	10.8
1972	1995	1860	135	47.4	41.1	6.3	24.7	12.9	11.7
1973	2075	1943	132	48.9	42.6	6.3	25	13.5	11.5
1974	2073	1940	133	48.8	42.4	6.4	24.9	13.4	11.5
1975	2090	1955	135	49.1	42.5	6.5	25.2	13.6	11.6
1976	2051	1921	131	48.1	42	6.1	24.3	12.9	11.4
1977	2099	1967	132	48.7	42.5	6.2	25.2	13.7	11.5
1978	2247	2108	139	52.1	45.6	6.5	27.2	15.1	12.1
1979	2297	2137	161	53.6	46.5	7.1	30	15.9	14.2
1980	2327	2153	174	54.3	46.7	7.6	33.1	17.6	15.5

Source: FAO, Supply and Utilization Accounts database

The increases in per capita nutrient availability from animal sources since the mid-1960s were small, and vegetal sources continued to provide for around 95 per cent of energy supply and around 90 per cent of protein supply. Tables 4.3a through 4.3d examine the diversion of food grains towards feed. Only around 10 per cent of domestic supply of all cereals was used as feed in 1966 but this figure rose significantly to around 17 per cent in 1978 (Table 4.3a). Maize was the most significant feed grain by the1970s, accounting for nearly 4/5th's of the total cereal feed (Table 4.3b). Given that the domestic supply of all cereals had expanded by 60 per cent or nearly 90 million tons (in processed equivalent) in the period between 1966 and 1978, the rising share diverted to feed assumes greater significance. The share in cereal feed in 1978 was equivalent to 14.2 per cent of per capita calorific supply from all sources of food (estimated from Table 4.3d and 4.3e).

This appears inconsistent when examined in the light of the quantities diverted towards feed of grain and other vegetal products. This apparent inconsistency arises owing to a large inventory of draught animals that continued to be important as regards agricultural production in an integrated agriculture and livestock system in China in this period.

Food Availability and Nutrition: 1965-80

Piazza (1983:8) notes that per capita nutrient availability increased significantly between 1950 and 1958 to reach over 2000 Kcal per day, approximating to prescribed daily requirements. Severe disruption in food production and therefore sharply decreased food availability is reflected in the steep declines for the period 1959-65. In 1960, the per capita daily energy availability fell by about 30 per cent from the level in 1958–below 1600 kcal[22]. Though nutritional levels recovered in 1966 to the high levels of 1956-58, it was not until 1970, when a gradual upward trend over these levels begins to manifest. And only from 1973, the highest levels of pre-1958 per capita grain production of 296 kgs (unprocessed equivalent for paddy, including tubers, soybeans and pulses), was attained.

It was clarified in the previous section that the average per capita grain production data does not provide a complete or accurate picture of food consumption or nutrition. The more representative data in this regard would be average per capita grain availability as food. Tables 4.4a and 4.4b, clearly bring out the difference between these two variables. While production per capita of all cereals increased from about 180kgs in 1965 to over 200 kgs in 1973 and further to almost 232 kgs, the figures for the per capita availability of processed grain directly available as food were 150 kgs, 158 kgs and 179 kgs in the respective years.

Table 4.4a: Per Capita Availability of Selected Nongrain Vegetal Food Items and Animal Products 1964-80, Kgs Per Year

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Meat, Fish and other Animal Products																	
All meat	8.2	9.1	9.6	10	9.7	9.3	9.1	10	10.8	10.7	10.6	10.6	10.5	10.6	11.3	13.4	14.6
Pork	6.6	7.4	7.9	8.2	7.9	7.5	7.2	8.1	8.8	8.6	8.5	8.5	8.3	8.3	8.9	10.9	12
Beef	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Mutton	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5
Poultry	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.5	1.6	1.6	1.7
Other-meat	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Milk*	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.3	2.4	2.4	2.4	2.6	2.7	3.1	3	3
Eggs	2	2	2	2	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.6
Total Fish	4.7	4.9	4.8	4.7	4.9	4.7	4.5	4.8	5.1	5.1	5.4	5.6	5.6	5.7	5.4	5	5.2
Freshwater Fish	1	1.2	1.1	1.1	1.1	1	1.2	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3
Marine Fish	3.7	3.7	3.7	3.6	3.8	3.7	3.3	3.7	4	3.9	4.2	4.4	4.4	4.5	4.2	3.8	3.9

22 See Piazza (1983: 13).

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Selected Non-grain Vegetal Food Items																	
Oilcrops	6	5.2	6.7	6.6	6.1	5.7	6.2	6.3	5.4	6	5.5	5.2	4.9	4.8	4.9	5	5.4
Vegetable Oils	1.7	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.8	1.9	1.9	2	1.9	2.1	2.4	2.6	3.2
Sugar	2.6	2.9	3	2.7	3	3	2.9	2.8	3.1	3.4	3.3	3.3	3.5	4.1	4.3	4.8	5.4
Vegetables	54.9	56.9	54.6	54.2	55.6	56	44.4	48.4	43.2	47.2	46.5	47.2	46.1	47.8	52.1	51.8	49.4
Fruits **	4.4	4.6	4.8	5.1	5.2	5.1	5	4.9	5.5	6.3	6.3	6.3	6.3	6.4	7.1	7.5	7.3

Source: FAO, Supply and Utilization Accounts database. Sugar includes all types of sweeteners; *Milk excludes diversion towards butter production;

**Fruits excludes diversion towards wine production.

Table 4.4b: China-Availability Per Capita of Grains, Tubers and Pulses, 1964-80, Kgs Per Year**

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Cereals																	
Rice (milled)	69.8	72.4	76.4	72.8	71.7	69.6	78.4	80.5	77.2	79.8	79.6	79.9	79.4	80.6	84.3	87.7	84.1
Rice (Paddy)	104.7	108.6	114.5	109.1	107.5	104.4	117.6	120.7	115.8	119.6	119.3	119.8	119	120.8	126.4	131.5	126.1
Wheat	28.3	33.8	33.4	33.1	32.9	32.1	33.7	34.3	37.6	38	40.3	43.5	45.1	45.8	53.8	55.7	60.9
Maize	18.8	18.4	18.5	19	19.2	19.8	19.7	19.7	19.5	19.7	20.7	21.1	21.4	22.6	24.2	25.9	25.8
Millet	7.8	7.6	9.3	9.3	9.2	9	9.2	8.9	7	6.6	6.1	5.5	4.9	4.9	4.9	4.8	4.4
Barley	5.9	5.3	4.1	3.3	2.4	2.4	2.6	2.7	2.5	2.7	2.8	2.8	2.7	2.6	3	2.7	2.6
Sorghum	8.3	8.5	9	9.2	9	8.1	8	8	7.3	7.5	6.9	6.6	6.1	5.7	5.1	4.9	4.5
Rye	1.3	1.4	1.2	1.2	1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1	1.2	1.4	1.1
Oth. Cereals	1.5	1.7	1.6	1.6	1.3	1.5	1.7	1.7	1.7	1.9	2	2.3	2.1	1.5	2	2.1	1.5
All Cereals*	142.3	149.9	154.1	149.8	147.3	144.1	154.9	157.6	154.4	157.7	160.2	163.4	163.5	165.3	178.9	185.8	185.7
Tubers																	
Potatoes	10.4	11.8	12	11.9	11.2	11.9	13.4	12	13	15.6	13.4	12.4	10	12	13.2	11.9	9.9
Sw. Potatoes	71.7	91	101	96.5	92.1	98.7	102	93.9	88.9	101.6	98.2	94.5	86	91.3	94.1	79.9	78.8
Other tubers	2.1	2.1	2.2	2.2	2.4	2.4	2.4	2.6	2.6	2.6	2.4	2.4	2.4	2.5	2.5	2.5	2.5
All Tubers	84.2	104.9	115.2	110.6	105.7	113	117.8	108.5	104.5	119.8	114	109.3	98.4	105.8	109.8	94.3	91.2
Tubers(dry)	16.84	20.98	22.12	22.12	21.14	22.6	23.56	21.7	20.9	23.96	22.8	21.86	19.68	21.16	21.96	18.86	18.24
Main Vegetal Protein Sources																	
Oth. Pulses	4.6	4.2	2.9	2.7	2.3	2.1	2.2	2.2	2.2	2	1.8	1.8	1.9	1.7	1.8	1.8	1.8
Beans	2.8	2.6	2.2	2	1.7	1.7	1.9	1.8	1.7	1.7	1.7	1.6	1.5	1.5	1.6	1.5	1.6
Peas	3.6	3.4	2.8	2.4	2	1.8	1.8	1.9	1.9	1.7	1.6	1.6	1.7	1.5	1.6	1.7	1.6
All Pulses	11	10.2	8	7.1	6	5.5	5.8	5.9	5.8	5.4	5.1	5	5.1	4.7	5	5	4.9
Soybeans	5	4.2	5.6	5.6	5.2	4.9	5.2	5.3	4.5	5.1	4.5	4.4	4.2	4	4	4	4.1

Source data: FAO, Supply and Utilization Accounts database. *Cereals exclude diversion towards alcoholic beverage production and includes milled.

Equivalent of rice rather than paddy rice; #Figures for Dry Tubers are $1/5^{th}$ of harvested weight. Oth. refers to other. Sw. refers to sweet.

** Availability directly in the form of food

It can also be observed that while both per capita production and availability of rice, wheat and maize increased consistently, the reverse was the case with other cereals. In the case of all other grains–following the Chinese definition that includes tubers and pulses–the changes were not significant in terms of per capita except in the case of pulses where the decline was 50 per cent-from around 10kgs per capita in 1965 to just 5 kgs in 1978.

As regards availability of animal products, the increase in per capita terms was marginal over the period 1965-78. In the case of meat (of all types) the increase was just over 2 kgs to 11.3kgs in 1978 (Table 4.4a). Given the increase in population by over 244 million (or 222 million in Piazza's population series), the achievement cannot be understated. The increase in total meat production over the period was of the order of over 4 million tons, over 75 per cent of which was pork. The increases in per capita terms of other vegetal food items were not significant over the period. For instance, vegetable oil rose by less than a kilogram, sugar by less than 2 kgs, whereas vegetables declined by more than 4 kgs to just over 52 kgs. Only in the case of fruits, was there an increase in the order of over 50 per cent, but this was over a very small base of just 4.6 kgs in 1965.

Table 4.5a: China–Nutrition Per Capita From Vegetal and Animal Sources

	Carbohydrates Calories Per Day			**Protein, Grams Per Day**			**Fat, Grams Per Day**		
	Total	Vegetal	Animal	Total	Vegetal	Animal	Total	Vegetal	Animal
1961	1641	1584	57	42.7	39.1	3.5	15.1	10.7	4.4
1962	1725	1659	66	45.4	41.2	4.1	16.2	11	5.2
1963	1785	1694	91	46.3	41.4	4.9	19.2	11.7	7.5
1964	1852	1745	108	47.9	42.5	5.4	21.8	12.6	9.2
1965	1972	1855	117	49.2	43.4	5.8	22.9	12.9	10
1966	2045	1923	122	50.2	44.2	6	24.2	13.7	10.5
1967	1983	1858	125	48.8	42.7	6	24.4	13.6	10.8
1968	1934	1812	121	47	41.1	5.9	23.4	13	10.4
1969	1913	1797	116	45.8	40.1	5.7	22.7	12.8	10
1970	2026	1913	113	47.9	42.3	5.5	23.3	13.6	9.8
1971	2041	1916	125	48.7	42.7	6	24.4	13.6	10.8
1972	1995	1860	135	47.4	41.1	6.3	24.7	12.9	11.7
1973	2075	1943	132	48.9	42.6	6.3	25	13.5	11.5
1974	2073	1940	133	48.8	42.4	6.4	24.9	13.4	11.5
1975	2090	1955	135	49.1	42.5	6.5	25.2	13.6	11.6
1976	2051	1921	131	48.1	42	6.1	24.3	12.9	11.4
1977	2099	1967	132	48.7	42.5	6.2	25.2	13.7	11.5
1978	2247	2108	139	52.1	45.6	6.5	27.2	15.1	12.1
1979	2297	2137	161	53.6	46.5	7.1	30	15.9	14.2
1980	2327	2153	174	54.3	46.7	7.6	33.1	17.6	15.5

Source: FAO, Supply and Utilization Accounts database

While the trends in the per capita availability of various foods over a period are useful to evaluate changes in the composition of food, the net changes in the availability of total energy and other nutrients are relevant to understand overall improvements (or otherwise) in overall food availability. There are other studies that

have examined pre-1978 food consumption in China. Here, Piazza's estimates are compared with estimates derived from the FAO-SUA data.

The observations and conclusions on trends in energy and nutrient supply per capita during the period 1965-78 in the FAO estimates are similar to those drawn by Piazza (1983). The variations with regard to actual values are only marginal. In Table 4.5a and 4.5b, the two estimates are compiled. Clearly, the lower population figures in Piazza's series, in the period after 1972, are reflected in higher energy supply (carbohydrates) per capita. The population data series used is from the World Bank Demographic Model for China and Piazza acknowledges the possibility of undercount of population leading to a positive bias in the estimates of per capita nutrient availability[23]. However, even for the period before 1972, the estimates of Piazza are higher. Further, this is also the case with total protein availability as well as from vegetal sources. Since FAO conversion ratios are used in Piazza's work, it is more likely that the assumptions with regard to estimation of seed, feed, waste[24] and uses other than food, emerges as an additional factor explaining the variance[25]. It was seen earlier that production figures for various foods in Piazza's study were also at some variance with the FAO data. The observations are summarized below:

Table 4.5b: Piazza's (1983) Estimates of Per Capita Nutrient Availability, China, 1961-80

	Carbohydrates Calories Per Day			Protein, Grams Per Day			Fat, Grams Per Day		
	Total	Vegetal	Animal	Total	Vegetal	Animal	Total	Vegetal	Animal
1961	1569	1519	49	42.9	40.1	2.8	16.3	10.7	4.4
1962	1679	1629	50	45.7	42.9	2.8	16.8	11.0	5.2
1963	1803	1731	72	46.8	43.2	3.7	19.2	11.7	7.5
1964	1966	1881	85	50.7	46.6	4.1	21.9	12.6	9.2
1965	1997	1906	91	53.9	49.6	4.3	22.4	12.9	10.0
1966	2106	2010	95	54.0	49.6	4.5	23.2	13.7	10.5
1967	2067	1970	97	53.0	48.6	4.4	23.3	13.6	10.8

23 Piazza (1983: 34), also notes the omission of some proportion of food supplies diverted to manufacturing adding to the positive bias.

24 With regard to extraction rates for rice, Piazza notes that small scale antiquated technologies in China resulted in a loss of 33 per cent as opposed to 30 per cent using modern large scale rubber rollers and therefore reduced the availabilities of per capita energy supplies by roughly 2 per cent and protein and fat by 1 per cent. It may be pointed out in this regard that in integrated farming systems using substantial animal power, the by products are used as feed and higher extraction rates would have meant lower residues for feed to be compensated later by some amount of grain.

25 The use of grain and other food items in the manufacture of alcoholic beverages and manufactured products such as tofu (soybean curd) are assumed as insignificant in Piazza's estimates. Ibid: 34.

	Carbohydrates Calories Per Day			Protein, Grams Per Day			Fat, Grams Per Day		
	Total	**Vegetal**	**Animal**	**Total**	**Vegetal**	**Animal**	**Total**	**Vegetal**	**Animal**
1968	1951	1859	93	49.8	45.7	4.2	22.2	13.0	10.4
1969	1898	1809	88	48.3	44.2	4.1	21.7	12.8	10.0
1970	2092	2006	86	52.7	48.6	4.1	22.9	13.6	9.8
1971	2098	2000	98	51.0	46.4	4.6	23.6	13.6	10.8
1972	2021	1913	107	49.5	44.6	4.9	23.8	12.9	11.7
1973	2175	2069	106	53.3	48.4	4.9	24.8	13.5	11.5
1974	2209	2105	104	54.5	49.7	4.9	24.6	13.4	11.5
1975	2226	2122	104	55.1	50.3	4.9	24.6	13.6	11.6
1976	2235	2132	103	56.5	51.8	4.8	24.0	12.9	11.4
1977	2248	2145	103	56.3	51.5	4.8	24.7	13.7	11.5
1978	2370	2261	109	58.3	53.3	5.0	25.4	15.1	12.1
1979	2572	2441	130	65.5	59.9	5.6	30.7	15.9	14.2
1980	2496.29	2351.94	144.35	64.05	57.96	6.10	32.54	17.6	15.5

Source: Piazza (1983:9 Table 2.1)

As observed earlier, a comparison of the estimates of production by Piazza and those from FAO data does not show marked differences. In Table 4.5c, this data is grouped by 3-year averages and growth over the period is estimated. This procedure moderates the annual variations in grain production and therefore more appropriate to evaluate trends over the period. A similar grouping of data by three-year moving averages for (a) the disappearance of cereals during 1961-78 and (b) changes in per capita supplies of energy, protein and fat, are compiled in Tables 4.6a and 4.6b respectively.

1. Grain production expanded by 90 per cent (FAO series), while population expanded by 40 per cent during 1961-78 (Table 4.5c). For the shorter period 1964-78, the figures respectively were 50 per cent and 31 per cent respectively. This ensured that per capita supplies of grain increased by 36 per cent and 14 per cent respectively.

2. For the longer period until 1980, (since reforms were only officially sanctioned by the end of 1979) per capita grain (all food grains) production increase was higher at 45 per cent during 1961-80. For the period, 1964-80, the increase was 21.2 per cent.

3. The expansion in the production per capita of rice and wheat together over the period 1961-78 was 57 per cent (in the FAO estimates but higher at 63 per cent in Piazza's) and the smaller expansion in total grain per capita was due to a slower growth in production per capita of other grains.

4. The share of rice and wheat in total grain increased from roughly half to over 60 per cent. It was discussed in the previous chapter that the sown areas of rice and wheat increased at the cost of other grains (particularly Maize as other coarse grains production fell sharply) given that expansion in cultivable area was severely restricted. But this enabled an increase in the per capita availability of total grains.

5. Net imports of cereals were significant in augmenting domestic supply over the entire period (Table 4.6a). Over the period 1964-78, the increase in net imports were close to 49 per cent, though as a share of domestic supply until 1976, it was on average less than 3 per cent and during 1977-78 it averaged 4.75 per cent. Thus, domestic output expanded by 58 per cent during 1964-78, where as Domestic supply was one percentage point higher.

Table 4.5c: China: Changes in Production of Food grains and Cereals–Piazza's and FAO estimates, 1961-80

			Grain Production*		Per Capita Production				Indices			
	Population (millions)		MMT		Wheat +Rice		All Food Grains		Wheat +Rice		All Food grains	
	Piazza	FAO	Piazzaa	FAO	Piazzaa	FAO	Piazza	FAO	Piazzaa	FAO	Piazzaa	FAO
1961-63	688.7	686.3	159.2	157.3	116.0	120.4	231.1	229.3	100.0	100.0	100.0	100.0
1964-66	736.1	733.6	198.7	200.8	152.8	157.4	269.9	273.7	131.7	130.8	116.8	119.4
1967-69	795.8	792.7	212.6	216.9	153.5	158.0	267.2	273.7	132.3	131.3	115.6	119.4
1970-72	858.2	855.6	243.5	247.7	169.5	173.5	283.8	289.5	146.0	144.2	122.8	126.3
1973-75	909.7	914.5	274.9	278.4	180.5	182.9	302.2	304.4	155.5	151.9	130.8	132.8
1976-78	947.0	963.0	291.3	299.5	188.9	189.2	307.6	311.0	162.8	157.1	133.1	135.6
1979-80	974.3	997.4	325.2	330.7	205.2	204.4	333.8	331.6	176.9	169.8	144.4	144.6
Percentage Change over Periods												
1961-80	41.5	45.3	104.3	110.2	76.9	69.8	44.4	44.6				
1964-80	32.3	36.0	63.7	64.7	34.3	29.8	23.7	21.2				
1961-78	37.5	40.3	83.0	90.3	62.8	57.1	33.1	35.6				
1964-78	28.6	31.3	46.6	49.2	23.6	20.2	14.0	13.6				

Note: MMT is million metric tons; * Grain includes soya and starchy roots at 1/5th weight.

Source: Table A4.1.

Table 4.6a: Cereals Disappearance by Main Components and Per Capita Domestic Supply and Availability, 1961-78

	Millions of Metric Tons										Per Capita (Kgs)	
	Prdn.	**Stock**	**M**	**X**	**nM**	**DS**	**Feed**	**Food Manu.***	**Waste**	**Food**	**DS**	**Food**
1961-63	122.6	0.1	7.6	1.6	5.9	128.6	10.3	0.1	7.3	102.0	179.5	142.2
1964-66	133.5	-1.0	7.6	1.8	5.8	138.3	12.1	0.2	8.0	109.2	188.6	148.8
1967-69	145.8	1.1	6.0	1.8	4.1	151.0	16.7	0.2	8.7	116.5	190.5	147.1
1970-72	167.9	-0.1	7.1	1.8	5.3	173.1	20.3	0.3	9.9	133.2	202.3	155.6
1973-75	191.5	-0.7	8.7	2.6	6.1	196.8	28.8	0.4	11.2	146.7	215.2	160.4
1976-78	211.0	0.3	10.3	1.6	8.7	220.0	35.1	0.8	11.4	163.0	228.4	169.2
Percentage Change over Periods												
1961-78	**72.1**	313.9	36.1	-1.5	46.4	**71.1**	242.0	421.4	55.3	59.9	**27.3**	**19.0**
1964-78	**58.0**	-131.7	35.3	-9.2	48.8	**59.0**	189.7	384.3	42.6	49.3	**21.1**	**13.8**

*Food Manufacture; Prdn. Is Production or output; M, X and nM refer to imports, exports and net imports respectively. Dom. Supply is Domestic supply.

Source: Table 4.2a

6. Per capita domestic supply of total cereals increased by over 21 per cent during 1964-78, and that directly available as food by about 14 per cent. This was due to an increase in the diversion towards feed–that expanded from a small base of 12.1 million Mt during 1964-66 to 35.1 million Mt during 1976-78 or almost 190 per cent increase. Significantly, waste and other uses also expanded by 42.6 per cent during 1964-78.

7. The net effect of changes in domestic supply, population, net imports, feed and composition of cereals and food grains can be inferred from the changes in energy, protein and fat availability per capita. Table 4.6b summarizes the trends for the period 1961-80. The expansion in total energy supply (calories per day per capita) was over 18 per cent during 1964-80 and that in protein availability close to 10 per cent. The availability of fat per capita per day rose from 16.8 grams during 1961-63 to 23 grams in the next three years and further to 31.6 grams.

8. Vegetal sources of energy accounted for over 90 per cent of the total throughout the period 1965-78–(See Table 4.6c). The share of cereals however, increased from around 66 per cent to over 69 per cent in the respective years owing to the decrease in the contribution from tubers and pulses. On the other hand, animal sources of calories though accounting for less than 10 per cent over the period, expanded by almost 45 per cent during 1964-80.

Table 4.6b: China: Growth in Per Capita Energy, Protein and Fat Availability by Sources, 1961-80

	Energy, Calories Per Day			Protein, Grams Per Day			Fat, Grams Per Day		
	Total	Vegetal	Animal	Total	Vegetal	Animal	Total	Vegetal	Animal
1961-63	1717	1646	71	44.8	40.6	4.2	16.8	11.1	5.7
1964-66	1956	1841	116	49.1	43.4	5.7	23.0	13.1	9.9
1967-69	1943	1822	121	47.2	41.3	5.9	23.5	13.1	10.4
1970-72	2021	1896	124	48.0	42.0	5.9	24.1	13.4	10.8
1973-75	2079	1946	133	48.9	42.5	6.4	25.0	13.5	11.5
1976-78	2132	1999	134	49.6	43.4	6.3	25.6	13.9	11.7
1979-80	2312	2145	168	54.0	46.6	7.4	31.6	16.8	14.9
Percentage Change Over Periods									
1961-80	34.7	30.3	134.8	20.4	14.9	76.4	87.4	50.4	160.5
1964-80	18.2	16.5	44.8	9.9	7.5	28.2	37.4	28.2	50.0
1961-78	24.2	21.5	87.9	10.8	6.9	50.4	51.9	24.9	104.7
1964-78	9.0	8.6	15.9	1.1	0.0	9.3	11.3	6.4	17.8

Source: Table 4.5a

Table 4.6c: Share of Various Food Categories in Total Nutrition 1961-80 (continues)

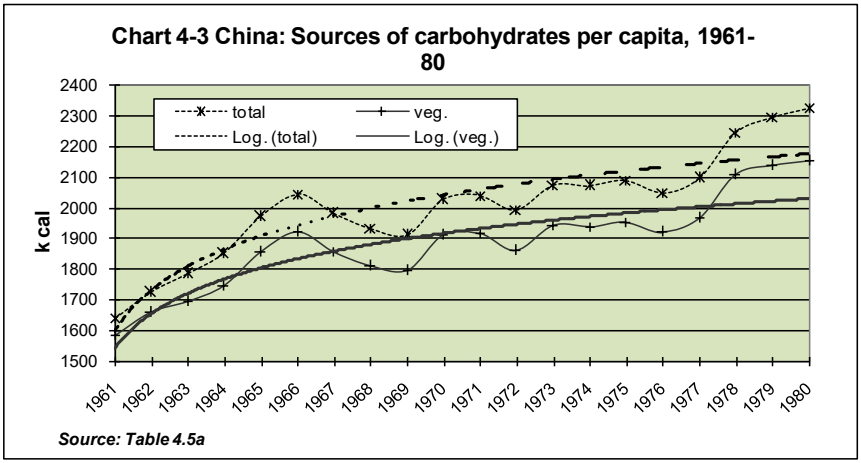
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Sources of Total Carbohydrate availability (%)										
All Cereals	61.9	62.3	65.3	67.0	66.1	66.0	66.1	66.7	65.9	67.3
Tubers	18.0	17.0	14.2	11.9	14.0	14.9	14.7	14.4	15.6	15.4
Pulses	6.2	7.0	5.8	5.5	4.8	3.6	3.3	2.8	2.7	2.6
Edible Oil	2.7	2.6	2.8	3.0	2.3	2.9	3.0	2.7	2.6	2.7
Soybeans	2.2	2.1	2.2	2.3	1.7	2.2	2.3	2.2	2.0	2.1
All Vegetal	96.5	96.2	94.9	94.2	94.1	94.0	93.7	93.7	93.9	94.4
Animal sources	3.5	3.8	5.1	5.8	5.9	6.0	6.3	6.3	6.1	5.6
Sources of Total Protein Availability (%)										
All Cereals	51.8	51.1	54.0	55.1	56.9	57.4	57.4	58.7	59.0	60.3
Tubers	7.7	7.3	6.0	5.2	6.3	6.8	6.8	6.6	7.2	7.3
Pulses	15.7	17.6	14.9	14.2	12.8	9.8	8.8	7.7	7.4	7.3
Edible Oil	8.7	8.4	9.1	9.4	7.5	9.8	9.8	9.4	9.0	9.4
Soybeans	8.0	7.7	8.2	8.4	6.5	8.4	8.6	8.3	8.1	8.4
All Vegetal	91.6	90.7	89.4	88.7	88.2	88.0	87.5	87.4	87.6	88.3
Animal sources	8.2	9.0	10.6	11.3	11.8	12.0	12.3	12.6	12.4	11.5
Sources of Fat Availability (%)										
All Cereals	23.8	22.8	20.3	18.8	18.8	18.6	18.0	18.8	18.5	19.3
Tubers	5.3	4.9	3.6	2.8	3.5	3.7	3.3	3.4	3.5	3.9
Pulses	3.3	3.7	2.6	2.3	2.2	1.2	1.2	1.3	0.9	1.3
Edible Oil	11.9	11.1	9.9	10.6	8.7	10.3	10.2	9.4	9.3	9.9
Soybeans	6.6	6.8	5.7	5.5	3.9	5.4	5.3	5.1	4.8	5.2
All Vegetal	70.9	67.9	60.9	57.8	56.3	56.6	55.7	55.6	56.4	58.4
Animal sources	29.1	32.1	39.1	42.2	43.7	43.4	44.3	44.4	44.1	42.1
All meats	17.2	19.8	27.6	30.7	32.8	32.6	33.6	33.8	33.0	31.3
Pork	13.9	16.7	24.5	28.0	29.7	29.8	30.7	30.8	30.0	28.3

Source: FAO, Supply and Utilization Accounts database

Table 4.6c: Continued (2) Share of Various Food Categories in Total Nutrition 1971-80

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Sources of Total Carbohydrate Availability (%)										
All Cereals	68.1	67.9	66.8	67.7	68.3	69.6	68.8	69.2	70.4	69.0
Tubers	14.0	13.7	15.1	14.5	13.8	12.7	13.3	12.9	10.8	10.3
Pulses	2.6	2.7	2.4	2.3	2.2	2.3	2.0	2.0	2.0	2.0
Edible Oil	2.7	2.4	2.5	2.4	2.2	2.0	2.0	2.0	2.0	2.2
Soybeans	2.1	1.7	1.9	1.8	1.6	1.6	1.6	1.5	1.4	1.5
All Vegetal	93.9	93.2	93.6	93.6	93.5	93.7	93.7	93.8	93.0	92.5
Animal sources	6.1	6.8	6.4	6.4	6.5	6.4	6.3	6.2	7.0	7.5
Sources of Total Protein Availability (%)										
All Cereals	60.4	60.8	60.1	61.3	62.1	63.4	63.4	64.3	64.7	64.3
Tubers	6.6	6.5	7.4	7.0	6.5	6.0	6.4	6.3	5.2	5.0
Pulses	7.4	7.4	6.7	6.4	6.1	6.4	5.7	5.8	5.8	5.5
Edible Oil	9.2	8.0	8.8	8.2	7.5	7.1	7.2	6.9	6.7	7.2
Soybeans	8.2	7.0	7.8	7.2	6.5	6.2	6.4	6.0	5.8	5.9
All Vegetal	87.7	86.7	87.1	86.9	86.6	87.3	87.3	87.5	86.8	86.0
Animal sources	12.3	13.3	12.9	13.1	13.2	12.7	12.7	12.5	13.2	14.0
Sources of Fat Availability (%)										
All Cereals	18.4	17.8	18.0	18.1	18.3	18.5	18.3	18.0	17.0	15.4
Tubers	3.3	3.2	3.6	3.2	3.2	2.9	3.2	2.9	2.3	2.1
Pulses	1.2	1.2	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.6
Edible Oil	9.4	8.1	8.8	8.4	7.9	7.0	7.1	7.0	7.0	7.3
Soybeans	4.9	4.0	4.4	4.4	4.0	3.7	4.0	3.7	3.3	3.0
All Vegetal	55.7	52.2	54.0	53.8	54.0	53.1	54.4	55.5	53.0	53.2
Animal sources	44.3	47.4	46.0	46.2	46.0	46.9	45.6	44.5	47.3	46.8
All meats	33.6	35.6	34.8	34.5	34.1	34.6	33.3	33.1	36.3	36.3
Pork	30.7	32.8	31.6	31.3	31.0	31.3	30.2	30.1	33.3	33.2

Source: FAO, Supply and Utilization Accounts database



9. Chart 4.3 shows a sharp recovery from the early 1960s of the per capita energy supply. Average per capita energy supplies increased from 1717 calories per day during 1961-63 to over 2000 calories by the early 1970s and further to 2132 calories during 1976-78. The broad trends in total energy supply from all sources of food together shows a gradual upward trend over the entire period 1960-78 (Chart 4.3). Piazza's estimates show a consistently higher energy supply levels during the entire period.

10. The predominant source of proteins has also been vegetal and cereals in particular in the entire period. However, the share of tubers, pulses, edible oil and soybeans together, that accounted for over a third (35.1 per cent) of protein supply in 1965, fell to a quarter in 1978 (Table 4.5a), while the share of all cereals rose by 7 percentage points to over 64 per cent in 1978.

11. Per capita availability of fat in 1965 was around 23 grams per day of which 56 per cent was from vegetal sources. This share fell only marginally to 55.5 per cent in 1978. The share of animal sources in total protein availability therefore remained roughly the same despite an increase in availability of animal products per capita. (Table 4.5a).

12. Domestic supply of preferred or higher quality foods–meat, vegetable oil, fruits etc-expanded substantially over the period leading also to an increase in per capita terms. This can be directly observed from Tables A4.2a to A4.2d (production increases) and Tables 4.4a and 4.4b (increases in availability). Thus food grains, particularly cereals, predominated as regards the source of energy and protein supply. Resource constraints (mainly land) and a hostile external trade environment until the late 1970s were the main reason for limited diversification of the consumption basket. Ishikawa (1977) estimated that the resource cost in terms of scarce land required for equivalent production of subsidiary foods (vegetable oils, meats and fruits according to the then official classification) to be 3.3 times higher for meats and 10 times higher for vegetable oils relative to food grains[26]. Here, it may be noted that mechanization in agriculture had indirect beneficial effects on food consumption by reducing the demand for draught animal power and therefore feed. As Tang (1980) noted, the feed saved accrued as an end product directly or indirectly in the form of livestock production[27].

26 See Ishikawa (1977: 94). In other words, meat, fruits and other subsidiary foods all use more land for equivalent calorie production. Ishikawa further notes that urban areas around the mid-1970s consumed 20 per cent less grain per capita but 2-3 times more meat and oils.

27 See Tang (1980) in Tang and Stone (1980: 25).

As noted earlier, the average per capita availability by definition, is an average of widely varying levels between different spending classes, between rural and urban areas and between regions. It does not reflect in any manner the actual food and nutrient supplies consumed by various groups of the population–sectoral, demographic or regional. Piazza compiles provincial data on per capita unprocessed grain production for the period 1949-89. These are reproduced in Tables 4.7a and 4.7b and reveal large variations across regions and time. The following observations on food availability at the provincial level are drawn from Piazza's discussion. In terms of per capita food production, China's provinces can be divided into mainly two groups: (a) those with above the national average per capita food production, including the Northeastern Provinces and seven provinces in the Huanghe and Changjiang river basins and (b) those below the national average, comprising the sparsely populated provinces and autonomous regions where animal husbandry predominates, as well as some densely populated provinces in central China.

The Northeastern provinces of Heilongjiang, Jilin and Liaoning were the main focus of the efforts to increase cultivated area and food production since the early 1950s. Large-scale agriculture with modern technology, organized as State farms with substantial state investment and support, characterized the agricultural strategy for this region. These provinces with low population densities and large areas of land reclaimed for cultivation, emerged as important grain baskets.

In the absence of official published time series data on provincial populations, the USDA estimates of per capita unprocessed grain production on which Piazza's study is based, rely on numerous sources to reconstruct annual mid-year figures. As Piazza notes; "both the population and grain production estimates are subject to considerable error". This is further compounded by changes in provincial boundaries in 1969 (and later in 1979)[28].

The significant variations in provincial per capita grain production bring up the issue of inter-provincial grain transfers on which detailed data is not available. Total trade in inter-provincial grain fell from 4.7 million tons in 1965 to 2.4 million tons by the late 1970s, accounting for 2.4 per cent and less than 0.7 per cent respectively of total grain production. Further, the number of provinces from which grain was transferred, declined from 15 to 8, whereas the numbers that received grain rose from 12 to 18, with the amount of grain transferred increasing from 6.55 million tons to 9.5 million tons in the respective years.[29] The decline can also be attributed to the

28 See Piazza (1983: 36-38) for a detailed discussion of these issues. Due to non-availability of data on many of the important food items uniformly across provinces until 1979, Provincial Food Balance Sheets have been constructed only for the years 1979 and 1980 – see ibid, Table 3.3, p. 42.

29 For the data on inter-provincial grain trade, Piazza (1983: 41-42) relies on Lardy (1982), "Comparative

actively encouraged policy of "local grain self-sufficiency" policy initiated in the early 1960s. Riskin (1986) argues that, this policy was dictated by necessity arising out of the complex process of redistribution as well as the heavy burden on the concerned state department. The decline though, did not reduce grain procurement by the state in the form of quota or tax. The proportion of total grain production purchased was 20 per cent in 1965 and fell gradually to only 17 per cent in 1978. The actual purchases in these two years were respectively 39.22 million tons and 50.72 million tons[30]. State grain purchases for the period 1965-78 indicate the extent of grain transfer not only across provinces but also within, in order to alleviate shortages in grain deficit areas within a province. Riskin (1986) however concludes that grain transfers across provinces, reduced variations in grain availability and that provincial distribution of grain became more equal[31]. Walker (1981) concluded from a detailed examination of provincial grain production data, that for 1978-80, the dispersion of provincial grain output per capita was narrower than in the period of rapid growth in overall production during 1952-57. Further, while per capita production of food grains had increased by over 10 per cent between the two periods, transfers to those provinces with grain deficits brought about the reduction in dispersion.[32]

Although it may be concluded from this exercise that there was a gradual improvement in food and nutrient availability in China over the period 1965-78, the lower than recommended levels of energy supply per capita until 1977, in conjunction with wide variations in provincial food production, would imply a serious violation of the 'food balance' discussed in section 4.1. We would expect this normally to be reflected in demographic and health variables such as life expectancy or morbidity. However, life expectancy increased significantly over the period and indications of large-scale malnutrition or disease are not available. The answer most likely lies in the egalitarian distribution system up to the early 1980s.

Poleman (1981) noted that under-reporting of production is common in most developing countries. This could be a possible reason, though difficult to verify or correct for. A plausible explanation could be found in the nature of China's collective institutional framework with regard to the distribution of income and ensuring

Advantage, Internal Trade, and the Distribution of Income in Chinese Agriculture", a paper prepared for the Trade and Development Workshop, Yale University, 1/25/82.

30 See Yamomoto (2000), Table 1. See also Riskin (1986:36 Table 11).

31 See Riskin (1986: 33-39) for a discussion on this issue.

32 Walker (1981) estimates that the index proposed in Atkinson (1973), accords greater weight to changes in the lowest income groups in order to evaluate overall improvement (which is the standard deviation of the logarithms), that firmly supports the argument. The inequality index estimates for the two periods are o.3279 for 1955-57 and 0.2319 for 1978-80. (A.B.Atkinson (1973), "On the Measurement of Inequality" in Atkinson A.B. (ed.) *Wealth, Income and Inequality*, Hammondsworth, Penguin).

minimum entitlements to food. In other words, it would be pertinent to examine whether the shortfalls in food and nutrient availability on average were mitigated by mechanisms that ensured an egalitarian distribution of available supplies. This is briefly taken up in the next section.

FACTORS MITIGATING FOOD INSUFFICIENCY IN CHINA

Smil (1981) concluded from his study on food availability in China, that there was virtually no improvement in average per capita food consumption over two decades until 1980[33]. Such a conclusion is not entirely misplaced considering the historically high levels of availability during the late 1950s, just preceding the disastrous years that followed the GLF strategy. The average grain production during 1956-58 was close to 295 kgs (Piazza's estimates) but fell sharply in 1959 to 248 kgs and further to 210 kgs per capita in 1960.These levels were attained again only in 1973 (296 kgs per capita, see table 4.6a last row). However, such a conclusion must be placed in the context of a strictly fixed cultivable area, an expansion of population and a rapid process of structural transformation during that period. Moreover, if the period of evaluation is extended backwards by about a decade (starting at 1950 instead of 1960), the conclusions are entirely positive and remarkable. In 1950, for instance, the total daily per capita energy availability was a mere 1600 kcal and by 1978, the figure had risen to 2370 kcal in Piazza's estimates or 2247 kcal in this study.

Food availability on average from the estimates in this chapter was below desired or recommended levels until the last years of the period under study, but this did not manifest in differentials of such an order across population groups or regions that is commonly observed in many developing countries[34]. The mitigation of food insufficiency was effective to a large extent due to the institutional strengths of the Chinese system. The economic system of China until 1978 can be viewed as one, where not only production was collectively organised to achieve the overall goals of national economic development, but also one where equal entitlement formed the basic principle for the distribution of the income at various levels of collective units.

33 See Smil (1981: 76).

34 The direct way of closing the gap between required and available levels would have been through imports. Cereals (and to some extent aquatic products) were the most significant of the category of imported food between 1965 and 1978, averaging 6 million tons per year. The average for 1977-78 was however of the order of 10 million tons, which according to Piazza'a estimates is the exact shortfall in availability in those years. But until 1975, the lower than required levels of grain imports to close the gap between availability and requirements may have been due to China's unfavourable international political position, in addition to the logistical problems in distributing the imported grain to deficit areas.

Thus the commune framework particularly in rural China, functioned as a powerful instrument to ensure full utilisation of labour, efficient allocation of resources, diversification of production and generation of savings that could be directed towards rural industrialisation. At the same time, it could distribute incomes in a manner that reduced differentials across and within administrative units.

By the mid-1960s, China's economic system was also highly decentralised in terms of decision making at various levels in the administrative hierarchy. As Griffin and Saith (1981) report, there were only 60 communes that functioned as accounting units out of 53,000 and in the case of brigades, the proportion was only 7-8 per cent[35]. While production decisions were decentralised, the higher administrative units were endowed with the authority to plan and provide resources that could not be raised in the lower units. Thus the higher administrative units implicitly played an important role in redistribution of productive resources. Though as Griffin and Saith (1981) observe, a high rate of growth as a national objective was never accorded primacy (with the exception in the early 1960s). It was one of the twin goals the other being equitable distribution of income[36]. From a detailed survey and analysis of commune accounts, they concluded that there were endogenous mechanisms determined by structural factors that promoted the tendency to equalize incomes within the commune framework. Further, there were three significant factors in this regard:

1. Allocation of jobs in the industrial sector at the county, provincial and state manufacturing establishments that operated outside the commune system.

2. Systematic transfer of capital in the form of grants and loans to poor brigades and teams, and [37]

3. Operation of private household economy in the rural sector of a socialist system so as to not threaten the system but to help raise income levels at local levels, thus reducing inequalities of per capita consumption.

35 The share of brigade level accounting units varied across provinces with Hebei at 12 per cent. Besides voluntary support from members, there may have been sound economic reasons for raising the level of the accounting unit in some parts of the country. These could either be to narrow average income differentials across teams; or to enhance institutional capacity to manage larger units or to redistribute a higher proportion of collective output. See Griffin and Saith (1981: 159).

36 Griffin and Saith (1981: 121) observe that "In the case of most countries, it might have been adequate to evaluate the operation of economic policies within the prevalent institutional framework. For socialist China however, it is necessary to view the existing institutional framework as itself a product of policy... ... a feature of the Chinese strategy was a high rate of discount of future income.. (that)... placed a strong limit on the level of acceptable short-run sacrifices for projected long term gains."

37 Ibid, p. 3. "One of the most powerful factors tending to equalize income among brigades is grants and loans for capital accumulation", as increasing the capital-labour ratio has the potential to increase incomes.

Lardy (1975) examined central-provincial fiscal relations until the early 1970s and noted that in 1972, provincial tax collections as a proportion of total national tax revenues amounted to 80 per cent, the same share as in 1958 and 1959. However, inter-provincial revenue transfers by the central government were substantial and this came about by means of a large proportion of tax revenues of richer provinces remitted to the centre. Redistribution usually took the form of transfers to poorer provinces, both through the social sector as well as via industrial investment. Lardy summarise the system as follows:

"The system of economic planning and management introduced in the late 1950's is perhaps usefully understood as a combination of relatively decentralised day-to-day management combined with relatively centralized control of most basic resource allocation decisions….This control is used to insure a high rate of overall investment, to allocate a large share of investment resources to the producer goods sector, and to achieve important equity and distributional goals"[38].

While the systemic strengths of the collective framework tended to reduce inter-temporal and inter personal income disparities, the food distribution system as a part of the overall structure, was designed to ensure a minimum entitlement to food rations[39]. Chinn (1980) examined the complex food distribution system in China that took into account multiple objectives of equity, efficiency, labour mobility as well as population control.Basic grain rations that were quantitatively fixed, based on requirements at the household levels (depending upon the number and demographic profile of its members), were first deducted from the total produce of the unit (usually the team) and the remainder was available for distribution according to work points accumulated over the accounting period[40].Work point values were arrived at by dividing the value of total output, after deduction for necessary (entitled) rations by the number of total work points. Each household's work point income was thus determined and when this exceeded the value of food grain allotment, the difference was either paid or recorded as cash income that could be used to meet other expenditure (other food, light consumer goods etc). As regards upward adjustments to procurement prices, Chinn notes that there was a simultaneous rise in both the value of food grain allotment and that of work point income[41]. In units where food

38 See Lardy (1975:111-115).

39 See Perkins (1975).

40 Chinn (1980) discusses in detail the quantitative parameters that were adjusted for age, gender, type of work besides regional and cultural specifications. Further, while rations are drawn throughout the year, income was distributed two or three times per year normally after harvests.

41 In 1961, grain procurement prices were raised by a quarter and retail prices of wheat flour and rice were raised by 7.5 per cent respectively and 2.7 per cent. In 1966 again, procurement prices of cereals were raised by 15-20 per cent and retail prices remained unchanged leading to a 4 billion yuan loss

grain production predominates or where value added in non-farming activities is small, the effect on household incentives to increase production through higher procurement prices may be limited[42].

In sum, despite an egalitarian system of income distribution and an efficient system of food distribution, by the time institutional reforms were introduced in rural China in the late 1970s and early 1980s, the officially acknowledged number of people with inadequate food intake was estimated to be around 200 million.

EVALUATING CHINA'S RURAL TRANSFORMATION (1965-78)

The discussion so far has examined various dimensions of agrarian change and rural transformation between 1965 and 1978. The focus was on certain characteristics of the transformation from a perspective that treats the Chinese case as distinct, not only from historically observed transformations of currently industrialized countries, but also in comparison to many contemporary developing countries. The uniqueness, based on equally unique historical conditions, demographic factors and political character of the Chinese state, poses challenges to economic theory and renders an evaluation based on conventional economic reasoning incomplete and even inconsistent.

While the development experience may be unique, Green (1978) dismisses the idea of a unique Chinese 'model': "First, models are a rather anti-dialectical approach, at least if one views them as more than explanatory devices serving for a brief period of time. By its nature a dialectical process would involve a sequence of models".[43] Further, "in the economic literature there has been an overriding assumption that efficiency meant the maximization of the level or the rate of growth of GDP. There really has never been an actual political decision-taker in history who had that objective"... "Efficiency surely relates to getting to some defined goal, you cannot specify what is efficient until you specify what the goal is. Equally you must specify some method of evaluating progress toward the goals".[44].

per year from 1974 to 1978. See Lardy (1984: 856).

42 See Chinn (1980: 745). As regards the urban food rationing system at the end of the 1970s, food needs were well met by a system that varied amongst urban localities across China and flexible enough to allow preferences to take effect through informal or formal exchange of ration entitlements of various food commodities.

43 Green (1978: 709).

44 Green (1978: 710). It is noted further that in the Chinese case, many of the goals were clearly defined with different methods adopted to achieving them, sometimes in a sequential manner, and at other times in an iterative or repetitive sequence (such as that with rural industrialization)

Green (1978) also highlights three important elements that guided Chinese policy. First, priority was accorded to increasing personal consumption through ensuring productive employment (employment as an entitlement right). In other words, growth of productive forces was recognized as being as vital to ensuring equality rather than a trade off against the other. Secondly, universal access to basic communal services was sought to be achieved through communal self-reliance. Thirdly, unused labour time was viewed as a potential productive asset that would help expand productive forces. The first goal therefore was to achieve full utilization of labour time, without perhaps very great attention to how productive the use was, so long as it was clearly positively productive.

A related view in this context can be found in Kueh (2006) where it is argued that the Chinese experience of rural development and change of the 1960s and 1970s, cannot be judged by neoclassical norms of income maximisation, peasant incentives or efficiency of cropping patterns based on market prices, but as a realisation of Nurksian theory. Kueh's uses the concepts of the "institutional hedge" and the "technological hedge". It was part of Mao's overall understanding that collective agriculture would be able to deal more effectively with natural calamities than individual peasant agriculture-the "institutional hedge". The "technological hedge" refers to the mobilisation of labour for large-scale irrigation and drainage projects, i.e technology suited to a labour-surplus capital-deficient China[45]. Both the "institutional hedge" and the "technological hedge" helped further strengthen agricultural production, as evident in the trends and levels of output from the mid-1960s onwards until 1980.

It may be argued that 'multiple dualism' describes more closely the Chinese experiments with varying techniques and technological possibilities in both modern industrial production, as well as for an institutionally revamped and reorganized agriculture since the mid-1950s. Thus, for instance, we saw the promotion of small-scale intermediate-technology based industrial production within the collective rural economy, alongside modern industrial production units in rural areas at the county level directly under the jurisdiction of the state. (The modern industrial complex was however organized as urban-based heavy and light industries under various institutional arrangements.) This is also the case with agriculture where elements of both traditional as well as modern technology were combined, with the technological mix depending on local conditions.

45 See Kueh (2006: 18, 48). On "backyard furnaces", Kueh points out that they were 'inefficient' in terms of turning out steel of low quality at costs that would be much less compared to large and more modern plants but the "benefits" from such a mobilisation approach overwhelmed the "costs".

A final issue regarding the slower than required growth of agriculture in China concerns incentives that form the foundation of market economies, where material incentives (in the form of higher wages) elicit increased productive efforts by labour[46]. Sen &Kynch (1983) argued in the context of peasant agriculture, that when economic behaviour is formulated at the level of households, individual decisions are mostly guided, not by maximisation of personal/individual welfare but by a combination of asymmetrical work effort and remuneration amongst the members of the household determined by factors such as gender or age. This has fundamental implications for economic analysis of household production activity. In a similar manner, it may be argued that when collective benefits outweigh individual rewards, the motive for work may not be based on individual returns to individual efforts.

Riskin (1973) notes that with the establishment of the production team as the basic unit of farm responsibility, organisation and distribution in the early 1960s, it was possible in principle that even without substantial individual incentives, peasants may have undertaken enthusiastic collective labour in the interests of increasing group output and income[47].

Based on his studies in a Guangdong village, Unger (1978) provides an elaborate discussion of the policies and mechanisms during the 1970s, which were directed at peasant efforts to contribute to collective activities towards local development. The conclusion is that the organizational methods devised were successful in assuring increased agricultural productivity, at least at the collective level. Further, the elevation of the production team as the central unit of decision-making and operation, has the advantage of smaller size (in contrast to communes and brigades). Peasant households therefore not only participated in the decisions regarding division of work but also could also discern rather clearly the benefits that emerged out of the collective team operations.

46 There has been some debate on this issue of disincentives arising out of collective sharing of incomes especially with regard to the period 1958-62 (Lin 1982). Fan (1997) also uses the argument that farmer's incomes were not closely tied to their production effort, even for the period 1966-76. Virtually all input and output markets were controlled by the government. Market exchanges of land between different production units in the collective system were also outlawed. Because farmers' incentives were low, inefficiency in agricultural production was rampant. Production grew at 2.7 percent, while there was almost no gain in total factor productivity.

47 Robinson (1969) discusses in some detail the peculiar circumstances during the Cultural Revolution, when the disruptions to production following intense political rivalries (at times assuming violent forms), were more than compensated by cadres and workers putting in additional efforts to achieve targets well before time. That production in the economy was not affected during the peak period of the Cultural Revolution violence (1966-68) is evident from the data on industrial and agricultural production. Despite reports of disruption in factories all over China, the effects were not such as to cause annual production to be affected. In fact, productivity actually improved during the period.

It may be pertinent at this stage to address the question of why such a system underwent fundamental changes towards the end of the 1970s and early 1980s. The next chapter begins by addressing this question and elaborating on the second transformation that unfolded in rural China during the next three decades.

Table A4.1: Total Grain Production and Population (mid-year) China, 1961-80

	Millions		Millions of Metric Tons							
	Population (mid-year)		Rice, Paddy**		Wheat		Total Grain		Other Grains*	
	Piazza	FAO***	Piazza	FAO	Piazza	FAO	Piazza	FAO	Piazza **	FAO
1961	680.2	672.8	53.64	56.22	14.25	14.29	147.50	142.86	79.61	72.35
1962	685.7	685.9	62.98	65.68	16.66	16.71	160.00	157.98	80.36	75.60
1963	700.2	700.2	73.76	76.44	18.47	18.49	170.00	171.18	77.77	76.25
1964	717.7	715.9	83.00	85.85	20.84	20.86	187.50	186.89	83.66	80.17
1965	735.7	733.1	87.72	90.71	25.22	25.24	194.52	198.75	81.58	82.80
1966	755.0	751.7	95.39	98.40	25.28	25.31	214.00	216.65	93.33	92.94
1967	774.3	771.7	93.68	96.73	28.48	28.51	217.82	220.20	95.66	94.95
1968	795.4	792.6	94.53	97.72	27.45	27.47	209.05	214.98	87.07	89.79
1969	817.7	813.8	95.06	98.00	27.28	27.29	210.97	215.63	88.63	90.33
1970	838.9	834.9	109.99	113.10	29.18	29.19	239.95	244.48	100.78	102.19
1971	858.6	855.7	115.20	118.13	32.57	32.58	250.14	253.72	102.37	103.02
1972	877.1	876.2	113.35	116.43	35.98	35.99	240.48	244.81	91.15	92.39
1973	894.7	896.1	121.73	124.58	35.22	35.23	264.93	269.49	107.98	109.68
1974	910.4	914.9	123.90	127.01	40.86	40.87	275.27	277.88	110.51	110.01
1975	924.0	932.5	125.56	128.73	45.31	45.31	284.52	287.78	113.65	113.75
1976	936.0	948.6	125.80	129.23	50.38	50.39	286.30	291.04	110.12	111.42
1977	947.0	963.3	128.56	131.92	41.07	41.08	282.72	287.42	113.09	114.43
1978	957.9	977.2	136.93	140.02	53.84	53.84	304.76	320.01	113.99	126.14
1979	968.9	990.6	143.75	146.85	62.73	62.73	332.11	336.53	125.63	126.96
1980	979.6	1004.2	139.26	142.88	54.16	55.21	318.22	324.91	124.80	126.82

Other grains include maize, soybeans, millets, sorghum, rye, oats, other minor cereals, pulses as well as starchy roots (at 1/5th weight). **The FAO series on Paddy rice is estimated by using the FAO conversion rate of 0.667 tons of milled equivalent for every ton of rice paddy. *** The FAO uses the mid-year population figures from the UN demographic database.
Source: Piazza (1983) Table 2.2, pp10 and FAO-SUA datasets

Table A4.2a: China: Production, Changes in Stock, Trade and Domestic Supply, Main Farm Products, 1964-80, Million Metric Tons

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	All Cereals*																
Production	123.8	132.0	144.8	149.0	144.6	143.9	163.2	172.8	167.7	180.4	192.3	201.7	207.2	199.4	226.4	243.8	232.7
Imports	7.8	7.6	7.5	5.9	6.2	5.8	7.6	5.4	8.2	10.0	9.2	6.8	6.3	11.3	13.2	17.2	18.0
Stock Change	-1.0	0.7	-2.8	-3.6	1.8	5.0	-0.9	-2.2	2.8	0.5	-2.8	0.1	-1.7	3.9	-1.2	-10.0	4.9
Exports	1.8	1.6	2.0	2.0	1.8	1.7	1.8	1.7	1.8	2.8	2.7	2.2	1.7	1.3	1.8	1.7	1.6
Domestic Supply	128.8	138.6	147.6	149.3	150.8	153.0	168.1	174.3	176.9	188.1	196.1	206.3	210.1	213.3	236.6	249.3	254.0

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Starchy Roots (Tubers)																	
Production	85.9	104.7	118.4	118.3	117.6	127.1	139.7	132.1	128.8	164.4	147.4	148.7	138.7	153.9	164.2	147.9	149.5
Imports	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.5
Stock Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
Exports	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.4	1.3
Domestic Supply	86.0	104.8	118.5	118.3	117.5	127.1	139.7	132.2	128.9	158.5	153.5	148.7	138.8	154.0	164.4	147.9	148.8
Pulses																	
Production	9.4	9.5	7.0	7.0	6.2	6.0	6.9	6.5	6.0	6.3	6.2	6.2	6.4	6.0	6.5	6.7	6.8
Imports	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Stock Change	0.1	-0.4	0.5	0.0	0.0	0.0	-0.6	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Exports	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Domestic Supply	9.4	9.0	7.4	6.9	6.2	5.9	6.3	6.5	6.5	6.3	6.2	6.2	6.3	6.0	6.5	6.7	6.7
Oilcrops																	
Production	15.3	14.6	17.5	17.6	17.2	16.1	17.9	17.7	15.5	18.5	17.7	17.3	15.4	16.2	18.1	19.2	21.4
Imports	0.3	0.2	0.2	0.4	0.5	0.6	0.7	0.6	0.8	0.9	1.2	0.9	0.9	1.1	1.2	1.8	1.6
Stock Change	-0.8	0.5	0.1	0.0	0.0	0.2	-0.5	-0.3	0.7	-0.6	-0.3	0.2	0.6	0.1	0.0	-0.5	0.4
Exports	0.6	0.7	0.7	0.8	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.2	0.2	0.4	0.3
Domestic Supply	14.2	14.7	17.2	17.3	16.9	16.3	17.6	17.5	16.5	18.5	18.3	18.1	16.6	17.2	19.1	20.1	23.2
Soybeans																	
Production	7.9	6.2	8.3	8.3	8.1	7.7	8.8	8.7	6.5	8.4	7.5	7.3	6.7	7.3	7.6	7.5	8.0
Imports	0.2	0.2	0.2	0.4	0.4	0.5	0.6	0.5	0.7	0.8	1.2	0.9	0.9	1.0	1.2	1.7	1.5
Stock Change	-0.6	0.6	0.0	0.0	-0.1	0.1	-0.5	-0.3	0.8	-0.6	-0.2	0.2	0.6	0.0	0.0	-0.1	0.1
Exports	0.5	0.6	0.6	0.6	0.6	0.5	0.4	0.5	0.4	0.3	0.4	0.4	0.2	0.1	0.1	0.3	0.1
Domestic Supply	7.0	6.4	8.0	8.1	7.8	7.8	8.5	8.5	7.6	8.3	8.1	8.1	7.9	8.2	8.6	8.7	9.5

Source Data: FAO, Supply and Utilization Accounts database, *(Excluding use in Beer Production)

Table A4.2b: China: Production and Domestic Supply of All Cereals, 1964-80, (million metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Rice (Milled Equivalent)																	
Production	57.3	60.5	65.6	64.5	65.2	65.4	75.4	78.8	77.7	83.1	84.7	85.9	86.2	88.0	93.4	97.9	95.3
Dom. Supply	56.4	59.8	64.5	63.1	63.9	64.1	74.0	77.8	76.6	81.0	82.5	84.4	85.1	87.1	92.2	97.1	94.5
Wheat																	
Production	20.9	25.2	25.3	28.5	27.5	27.3	29.2	32.6	36.0	35.2	40.9	45.3	50.4	41.1	53.8	62.7	55.2
Dom. Supply	26.6	31.8	31.9	32.2	32.4	32.8	35.2	36.4	41.1	42.3	45.1	49.5	51.6	52.2	61.6	64.9	71.7
Barley																	
Production	4.4	4.8	2.8	3.0	2.4	2.4	2.7	2.8	2.7	2.9	3.0	3.0	3.0	3.0	3.4	3.6	2.7
Dom. Supply	5.0	4.6	3.7	3.0	2.5	2.5	2.9	3.1	3.1	3.2	3.3	3.2	3.3	3.3	3.7	3.8	3.6
Rye																	
Production	1.3	1.5	1.3	1.3	1.1	1.3	1.4	1.3	1.3	1.4	1.4	1.5	1.6	1.2	1.7	1.8	1.4
Dom. Supply	1.3	1.5	1.3	1.3	1.1	1.3	1.4	1.3	1.3	1.4	1.4	1.4	1.5	1.3	1.7	1.8	1.4
Oats																	
Production	1.1	1.2	1.0	1.0	0.8	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.9
Dom. Supply	1.2	1.2	1.0	1.0	0.8	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.9
Millet																	
Production	7.0	6.2	9.0	9.0	8.5	8.5	9.8	9.5	7.0	7.0	7.5	6.5	5.6	6.2	6.6	6.2	5.4
Dom. Supply	6.6	6.6	8.4	8.7	9.0	8.9	9.2	9.2	7.5	7.3	7.0	6.4	6.0	6.1	6.2	6.1	5.7
Sorghum																	
Production	7.7	7.1	9.0	9.0	8.5	8.0	8.8	9.0	8.0	9.0	8.5	8.5	8.7	7.7	8.1	7.7	6.8
Dom. Supply	7.2	7.6	8.4	8.8	8.9	8.4	8.6	8.8	8.4	9.1	8.6	8.7	8.4	8.7	8.4	8.2	7.4
Other minor Cereals																	
Production	1.4	1.7	1.6	1.6	1.5	1.7	1.9	2.0	2.0	2.2	2.4	2.7	2.6	2.0	2.6	2.9	2.3
Dom. Supply	1.4	1.7	1.6	1.6	1.5	1.7	1.9	2.0	2.0	2.3	2.5	2.8	2.6	2.1	2.6	2.9	2.3
Total Cereals																	
Production	123.8	132.0	144.8	149.0	144.6	143.9	163.2	172.8	167.7	180.4	192.3	201.7	207.2	199.4	226.4	243.8	232.7
Dom. Supply	128.8	138.6	147.6	149.3	150.8	153.0	168.1	174.3	176.9	188.1	196.1	206.3	210.1	213.3	236.6	249.3	254.0

Source data: FAO, Supply and Utilization Accounts database.

Table A4.2c: China: Production, Domestic Supply and Share of Domestic Supply in Total Meat*, Various Meats, 1964-80, (10,000 tons, %)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Pork																	
Production (Mt)	482.5	559.6	608.9	641.9	633.3	615.4	613.9	709.1	787.4	794.1	785.0	799.6	798.4	801.9	877.2	1086.9	1212.5
Dom.Supply	474.0	542.6	591.4	631.1	623.8	607.1	604.5	695.7	769.7	774.4	776.6	791.3	790.7	797.3	870.0	1078.7	1202.5
Pork Share (%)*	80.2	81.2	81.7	81.9	81.3	80.2	79.7	81.0	81.5	80.9	80.2	79.8	79.1	78.1	78.7	81.3	81.8
Beef																	
Production (Mt)	15.3	16.8	18.1	18.6	18.9	19.6	19.8	21.5	23.0	25.0	25.8	27.0	27.0	28.5	28.2	31.5	34.2
Dom.Supply	16.4	18.0	19.2	20.1	20.3	20.9	21.7	22.8	24.3	26.8	27.4	31.4	30.1	31.2	30.9	34.0	36.1
Beef Share (%)*	2.8	2.7	2.7	2.6	2.6	2.8	2.9	2.7	2.6	2.8	2.8	3.2	3.0	3.1	2.8	2.6	2.5
Mutton																	
Production (Mt)	14.0	16.0	19.1	19.8	20.3	20.7	21.1	23.6	25.6	28.1	29.1	31.0	29.1	30.6	32.1	37.7	45.1
Dom.Supply	14.1	16.1	19.2	19.9	20.4	20.8	21.2	23.7	25.6	28.2	29.1	31.1	29.3	30.8	32.3	38.2	45.4
MuttonShare (%)*	2.4	2.4	2.6	2.6	2.7	2.7	2.8	2.8	2.7	2.9	3.0	3.1	2.9	3.0	2.9	2.9	3.1
Poultry Meat																	
Production (Mt)	77.2	81.0	83.7	87.6	90.5	94.6	97.1	102.5	110.2	114.1	119.7	123.9	133.0	144.1	153.1	159.1	166.3
Dom.Supply	77.8	81.5	84.1	88.3	91.5	95.8	98.7	103.7	110.9	114.7	121.4	124.5	134.4	146.4	154.8	160.3	168.8
PoultryShare (%)*	13.2	12.2	11.6	11.5	11.9	12.7	13.0	12.1	11.7	12.0	12.5	12.6	13.5	14.3	14.0	12.1	11.5
Other Meat																	
Production (Mt)	9.0	9.8	10.5	11.8	12.7	13.4	13.8	14.4	15.3	15.0	15.3	16.4	17.3	17.9	18.8	19.6	20.6
Dom.Supply	8.9	9.6	10.2	11.2	11.2	11.9	12.3	12.9	13.5	12.8	13.6	13.6	14.8	15.4	16.9	15.6	17.4
Other meat Share (%)*	1.5	1.4	1.4	1.5	1.5	1.6	1.6	1.5	1.4	1.3	1.4	1.4	1.5	1.5	1.5	1.2	1.2
Total (all) Meats																	
Production (Mt)	598.1	683.2	740.3	779.6	775.7	763.6	765.5	871.2	961.5	976.3	974.8	997.9	1004.8	1022.9	1109.4	1334.8	1478.7
Dom.Supply	591.2	667.9	724.0	770.6	767.2	756.6	758.4	858.7	944.0	956.8	968.1	991.8	999.3	1021.1	1105.0	1326.8	1470.2

Source data: FAO, Supply and Utilization Accounts database. * Dom. Supply refers to Domestic Supply and DS share (%) is share of each meat category in Total Meat.

Table A4.2d: China: Production, Domestic Supply and Trade of Milk, Eggs and Aquatic Products, 1964-80, 10,000 Tons and %

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Milk																	
Production	193.6	196.8	197.8	197.2	185.9	189.3	195.9	203.2	210.0	219.2	227.6	236.6	246.2	254.7	281.1	265.1	292.8
Imports	12.5	12.0	14.0	15.7	18.8	20.9	24.9	26.6	27.3	34.2	37.4	37.0	50.1	56.8	74.6	86.5	74.8
Exports	0.8	1.2	3.0	2.7	3.2	2.4	3.1	2.6	1.7	2.2	3.1	2.0	2.2	0.8	1.5	1.3	2.1
Net Imports in DS* (%)	5.7	5.2	5.3	6.2	7.7	8.9	10.0	10.6	10.8	12.8	13.1	12.9	16.3	18.0	20.6	24.3	19.9
Domestic Supply	205.4	207.6	208.8	210.2	201.5	207.8	217.7	227.3	235.6	251.3	261.9	271.6	294.1	310.7	354.3	350.3	365.3
Eggs																	
Production	161.2	165.6	170.8	176.1	181.0	187.8	193.1	200.2	207.0	214.4	222.0	231.2	241.4	251.2	264.4	278.1	293.5
Imports	4.2	4.1	4.2	3.9	4.0	4.3	4.7	5.2	4.9	5.2	5.0	5.5	5.4	6.0	6.4	7.2	7.3
Exports	4.5	6.0	6.0	5.3	6.0	5.2	4.7	5.6	5.7	5.7	5.4	4.8	5.3	4.6	4.9	5.9	6.4
Net Imports in DS* (%)	-0.2	-1.2	-1.1	-0.8	-1.1	-0.5	0.0	-0.2	-0.4	-0.2	-0.2	0.3	0.0	0.6	0.6	0.4	0.3
Domestic Supply	160.9	163.6	169.0	174.7	179.1	186.8	193.2	199.8	206.2	213.9	221.6	231.9	241.4	252.7	266.0	279.4	294.3
Total Fish and Seafood																	
Production	339.0	360.9	364.6	368.3	390.4	394.0	395.6	431.9	470.2	480.5	515.9	543.8	559.2	580.7	565.3	534.8	557.1
Imports	11.5	12.5	15.0	18.3	17.8	32.4	34.2	35.9	36.7	29.6	32.3	64.0	76.1	65.1	88.7	105.2	101.2
Exports	11.3	12.7	13.4	11.9	10.7	14.4	24.2	27.2	31.8	34.1	30.1	25.7	36.9	41.6	44.8	49.1	54.3
Net Imports in DS* (%)	0.1	-0.1	0.5	1.7	1.8	4.4	2.5	2.0	1.0	-0.9	0.4	6.6	6.5	3.9	7.2	9.5	7.7
Domestic Supply	338.6	360.1	365.4	373.1	396.1	410.8	404.7	440.0	474.9	476.5	517.2	582.3	599.3	604.4	608.9	592.6	607.3

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Freshwater Fish																	
Production	74.5	84.2	84.5	84.1	83.9	84.1	96.6	95.1	94.6	105.0	105.2	109.6	109.6	111.8	112.3	120.1	130.7
Imports	3.0	3.0	3.4	3.5	3.4	3.2	2.6	3.4	3.5	3.5	3.2	3.5	3.3	3.2	3.2	3.8	4.1
Exports	2.6	2.6	3.0	3.0	2.9	3.1	2.5	3.1	3.2	3.2	3.0	3.4	0.1	0.1	0.1	0.2	0.1
Net Imports in DS* (%)	0.5	0.5	0.5	0.6	0.5	0.1	0.1	0.3	0.3	0.3	0.1	0.1	2.8	2.7	2.7	2.9	2.9
Domestic Supply	74.9	84.6	85.0	84.5	84.4	84.2	96.7	95.4	94.9	105.3	105.4	109.7	112.8	114.9	115.4	123.7	134.7
Marine fish																	
Production	264.5	276.7	280.1	284.2	306.5	309.9	299.0	336.7	375.6	375.5	410.6	434.2	449.6	469.0	453.1	414.7	426.4
Imports	8.6	9.5	11.7	14.8	14.4	29.2	31.6	32.5	33.3	26.2	29.1	60.5	72.8	61.9	85.5	101.4	97.1
Exports	8.7	10.1	10.4	8.8	7.8	11.3	21.6	24.1	28.7	31.0	27.1	22.3	36.8	41.5	44.8	49.0	54.2
Net Imports in DS* (%)	-0.1	-0.2	0.4	2.1	2.1	5.5	3.2	2.4	1.2	-1.3	0.5	8.1	7.4	4.2	8.3	11.2	9.1
Domestic Supply	263.7	275.5	280.5	288.6	311.7	326.5	308.0	344.6	380.1	371.1	411.8	472.6	486.5	489.5	493.5	468.8	472.6

Source data: FAO, Supply and Utilization Accounts database. *Net Imports as a share of Domestic Supply (negative values imply net exports share)

Table 4.7a: Provincial Per Capita Unprocessed Grain Production,1949-80, Figures are Percentage of National Average)

	1949	1952	1957	1965	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
SICHUAN	111	89	108	0	0	0	0	0	0	0	89	86	97	101	95	102
GUIZHOU	95	79	105	0	110	105	105	0	0	78	0	0	0	0	66	72
YUNNAN	107	94	111	0	0	0	0	0	101	0	85	0	84	88	73	84
XIZANG	0	0	0	66	0	52	58	0	59	64	64	69	73	70	66	83
SHAANXI	114	88	84	86	0	94	0	0	97	103	110	0	76	90	94	82
GANSU	102	99	136	0	0	112	107	123	116	146	154	0	88	82	71	79
QINGHAI	95	76	105	0	0	69	80	99	79	86	91	90	76	74	64	78
NINGXIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	99
XINJIANG	104	116	122	0	0	0	127	123	118	114	125	0	90	95	91	94
HENAN	71	72	85	89	88	86	87	89	82	92	95	92	93	83	86	91
HUBEI	91	103	120	139	102	113	0	104	103	106	119	126	120	118	116	101
HUNAN	93	107	104	106	135	119	121	118	116	114	119	121	129	127	124	124
GUANGXI	103	112	94	116	107	106	0	127	0	111	112	111	105	100	99	104
GUANGDONG	100	88	109	110	0	0	0	0	102	108	0	0	0	89	89	96
SHANGHAI	42	0	0	56	0	0	0	0	0	69	0	72	61	71	66	50
JIANGSU	79	86	88	109	90	87	106	107	119	103	113	121	105	122	124	122
ZHEJIANG	90	113	104	0	120	116	0	132	0	108	120	78	110	119	124	115
ANHUI	72	95	116	113	0	112	117	122	121	120	114	127	104	95	97	92
FUJIAN	104	97	101	0	0	0	0	104	0	100	0	82	90	93	89	98
JIANGXI	113	120	124	0	0	0	0	0	0	0	0	106	117	112	117	117
SHANDONG	79	78	81	79	0	75	78	91	91	83	93	104	97	98	99	100
BEIJING	93	0	66	0	0	0	0	0	61	65	0	0	58	66	58	64
TIANJIN	0	0	0	0	0	0	0	0	0	0	0	50	0	50	54	56
HEBEI	58	83	79	92	105	102	98	93	99	105	102	0	0	104	101	90
SHANXI	89	89	75	0	0	82	91	0	0	99	105	0	0	91	95	85
NEI MONGGOL	148	161	103	0	0	0	0	73	80	88	87	98	0	0	80	65
LIAONING	89	84	83	0	0	0	0	0	0	0	0	0	101	99	101	108
JILIN	194	154	115	116	98	118	116	0	0	109	148	112	126	130	120	120
HEILONGJIANG	230	194	1.4	132	0	0	0	99	131	132	138	118	131	151	134	140

Source: Piazza (1983: 39, Table 3.1).("0" indicates data not available)

Table 4.7b: Provincial Per Capita Unprocessed Grain Production, 1949-80, (figures are kg/year)

	1949	1952	1957	1965	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
SICHUAN	238.3	258.7	326.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	277.4	268.3	292.5	325.1	328.8	332.7
GUIZHOU	205.7	230.0	318.2	0.0	286.5	305.1	311.1	0.0	0.0	238.9	0.0	0.0	0.0	0.0	230.1	235.2
YUNNAN	229.8	275.0	334.9	0.0	0.0	0.0	0.0	0.0	304.0	0.0	267.2	0.0	254.5	281.8	254.7	274.3
XIZANG	0.6	0.0	0.0	173.6	0.0	151.6	173.6	0.0	178.1	198.3	200.2	214.0	222.0	224.3	230.4	272.1
SHAANXI	245.2	255.9	254.1	227.2	0.0	271.8	0.0	0.0	293.5	317.4	343.8	0.0	229.8	290.8	325.5	268.3
GANSU	220.5	289.3	411.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	266.2	265.1	245.4	258.7
QINGHAI	204.3	222.1	319.5	0.0	0.0	201.5	237.8	275.5	239.0	263.3	284.2	279.1	229.8	237.3	221.9	256.4
NINGXIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	294.9	325.5
XINJIANG	224.8	338.6	370.2	0.0	0.0	0.0	374.4	342.2	354.5	350.6	391.2	0.0	272.4	306.1	316.6	306.9
HEH4N	154.2	211.2	257.6	233.7	229.1	248.5	259.0	249.4	248.0	283.5	296.8	286.0	281.8	268.6	299.0	296.7
HUBEI	197.4	299.3	364.7	364.9	266.5	326.0	0.0	291.3	309.7	327.5	372.9	390.1	361.6	380.3	401.4	329.7
HUNAN	199.7	311.7	316.5	279.6	351.9	344.3	357.0	329.5	349.5	352.0	370.6	375.8	389.5	407.4	427.4	404.0
GUANGXI	222.1	325.4	284.0	306.0	279.1	307.3	0.0	354.6	,00	341.5	348.9	344.5	316.1	321.3	341.5	339.8
GUANGDONG	216.6	256.8	329.0	289.3	0.0	0.0	0.0	0.0	306.3	331.7	0.0	0.0	0.0	286.9	308.6	315.5
SHANGHAI	90.5	0.0	0.0	148.8	0.0	0.0	0.0	0.0	.00.	212.9	0.0	223.2	185.9	227.3	230.4	164.1
JIANGSU	171.0	250.6	267.0	286.4	234.3	252.8	314.2	299.2	359.6	316.3	352.3	375.6	317.4	393.1	428.8	398.1
7.HEJIAN6	193.3	328.0	315.8	0.0	311.8	336.4	0.0	368.7	0.0	332.8	374.8	241.0	332.8	381.8	427.3	376.5
ANHUI	154.9	275.5	350.7	298.1	0.0	324.9	347.2	340.9	365.5	368.1	357.1	393.6	315.0	306.4	337.6	300.4
FUJIAN	224.3	282.9	306.0	0.0	0.0	0.0	0.0	289.0	0.0	308.3	0.0	255.4	272.2	298.9	308.4	320.2
JIANGXI	244.4	347.9	375.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	328.0	354.2	358.8	404.0	381.8
SHANDONG	170.1	227.1	245.3	209.1	0.0	217.7	231.2	255.1	273.3	254.1	290.7	323.1	293.3	316.5	343.7	327.8
BEIJING	200.4	0.0	201.7	0.0	0.0	0.0	0.0	0.0	183.4	201.1	0.0	0.0	174.4	214.1	200.4	211.7
TIANJIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	155.9	0.0	160.8	189.0	184.9
HEBEI	125.4	242.7	240.5	241.6	272.2	294.4	289.7	259.3	298.4	323.6	319.4	0.0	0.0	335.7	351.0	296.0
SHANXI	192.7	259.8	229.0	0.0	0.0	236.9	269.9	0.0	0.0	303.8	329.0	0.0	0.0	292.8	329.4	278.6
NEI MONGGOL	318.9	468.7	312.6	0.0	0.0	0.0	0.0	205.2	241.2	271.7	273.0	303.1	0.0	0.0	277.3	212.9
LIAONING	191.8	245.1	252.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	305.6	318.5	349.1	352.6
JILIN	416.9	446.6	349.1	304.2	254.4	342.5	343.5	0.0	0.0	334.8	463.1	347.6	378.8	417.8	415.7	391.7
HEILONGJIANG	495.1	564.6	423.6	347.2	0.0	0.0	0.0	277.4	395.6	404.1	429.9	365.1	395.1	486.2	464.2	458.8

Source: Piazza (1983:40, Table 3.2).(".00" indicates data not available)

5. Institutional Change and Economic Growth in China: 1978-2008

5.0 INTRODUCTION

By developing country standards, China's performance during 1965-75 was rather impressive, with GDP, industrial output and agricultural output having expanded, on average, at rates of 6.5 per cent, 10.4 per cent and 4 per cent respectively. By the early 1970s, the rural economy had diversified, following the revival of rural industrialization in the mid-1960s, that besides absorbing underemployed rural labour, created both physical industrial capital and human capital (in terms of skills to work with and manage modern industrial plants) in rural areas. Further, these industries, closely integrated with agriculture, supplied crucial modern inputs that were indispensable for productivity increases from improved high-yielding varieties developed in the second half of the 1960s. Grain production expanded faster than population growth during this period and by the mid-1970s, food grain availability, along with average nutritional levels, approached the peaks recorded during 1955-57.[1] The high priority to accumulation (investment or capital formation) however, restricted significant gains in household consumption both in rural and urban China. While, the agricultural sector, particularly grain production began to grow at a faster pace in the 1970s, owing to both technological advance (spread of high-yielding varieties and expanded supplies of chemical fertilizers) and vastly improved irrigation infrastructure, productivity had fallen in the urban industrial sector.[2] With changes in the political leadership after the mid-1970s and a simultaneous improvement in China's external relations, the period of the late 1970s and early 1980s emerged as one of major institutional reforms that altered significantly the erstwhile collective framework of production and distribution.

This chapter begins with a discussion of reforms in agriculture and an outline of the sequence of reforms in the rural sector. In the following sections, the rapid growth and structural change in the Chinese economy since the early 1980s is discussed in terms of changes in employment, investment and the external sector. The chapter

1 (Walker, 1982), however estimated that average rural grain consumption for 1978-80 was significantly below that of 1955-57 though urban levels showed a slight increase.

2 The gross value of industrial and agricultural output increased 9.1 times over 1952-78 whereas for net domestic product, this figure was only 5.3. The output per unit of capital for state-operated industry was -1.1 per cent during the same period (see Riskin, 1987: 263-64)

concludes the discussion by evaluating the nature of the growth process and the problems that have emerged in post-reform China. These include the slow growth of consumption, dependence on external demand and the widening of disparities in personal incomes, regional development and between the rural and the urban.

5.1 RURAL REFORMSOR DE-COLLECTIVIZATION AFTER 1978

From the discussion in the previous chapters, it was concluded that Chinese agriculture after 1965 and particularly in the 1970s, displayed an upward trend in terms of growth in output and productivity, besides a vastly improved infrastructure (in terms of water conservancy and irrigation) that reduced risks from weather related factors. Further, the introduction of high-yielding varieties in various grain crops and corresponding increases in modern inputs such as chemical fertilizers and pesticides as well as mechanization in the spheres of both farming and provision of irrigation, placed the sector on a firm new foundation of sustainable growth. It is therefore pertinent in this context to address the rationale for reforms that were deep and wide-ranging such as to alter the basic character of collective agriculture.

The dominant view as regards the introduction of reforms is that collective agriculture was a failure in terms of not raising the productive potential, in other words an inefficient organization of production and one that did not adequately remunerate the actual producers owing to a lack of incentives. Quite a different view is expressed in Saith (1985) where the Chinese case is examined as part of other socialist countries where reforms were initiated around that time.

"Thus, the de-collectivization and the peasantisation of the collective sector in a wide range of socialist countries are ironically being conducted as a response to the ostensible 'failure' of socialised agriculture. This is at least, in part, a travesty of truth. In reality, socialised agriculture has all too frequently been designed and used primarily as an *instrument* of primitive socialist accumulation...".[3]

Though by 1979, the share of net material product from agriculture, in the total, declined to 40 per cent from 60 per cent in 1952, 75 per cent of the total workforce was still engaged in agricultural activities. There had emerged a wide divergence in the productivity levels in agriculture and industry-in 1978, agricultural labour produced only 5 per cent more than the 1952 level, whereas the increase in the industrial sector was by a factor of 7.7 in the same period[4]. The structural and

3 Saith (1985: 36) continues "...having squeezed it to a point where it becomes unresponsive, the patient has now been declared deceased by the impatient doctors."

4 In 1952, the value added per worker in agriculture and industry were 345.8 and 696.4 (in yuan)

systemic imbalances that emerged as a consequence of the earlier strategy appear to have been significant enough to warrant reforms. Some of these issues are taken up later in the chapter following a discussion of the actual reforms and an examination of agricultural performance that resulted therefrom.

Selden (2006) argues that rural development initiatives following the North China Agricultural Conference of 1970, actually marked the start of the reform agenda that eventually led to the end of collective agriculture and the communes.[5] However, as Ash (1988) notes, it is customary to view the Third Plenum of the 11th CCP central committee (December 1978) as the formal beginning of reforms. Reforms were introduced in two stages beginning in 1979 with the introduction of a Household Responsibility system (HRS), which made the household the unit of accounting. Land was parceled out to households in proportion to their size, which in turn contracted a fixed amount of output to the procurement agencies at a fixed price.[6] For publicly owned means of production, mainly water conservancy systems, water charges were introduced and four types of contract management systems were established to facilitate management, use and maintenance.[7] As for the other means of production viz. farm machinery and draught animals, private ownership was recognized in 1984. The two major initial forms of contracts ('contracting output to the household' and 'contracting everything to the household', the *baochandaohu*and the *baogandaohu* respectively) were officially introduced towards the end of 1980.[8] But even prior to the formal legislation of this system, contracting of output to individual households or sub-contracting production to "work groups" (even though under the earlier system work groups had independence of implementation and work organization) had already been undertaken in some areas. There is a close similarity in such experiments with those during the formation of co-operatives in the early

respectively - a ratio of 2:1. By 1978 these figures respectively were 364.3 and 2809.2 (in yuan) giving a ratio of 7.7:1 (Yang and Li, 1980)

5 Selden (2006: 685).

6 A sample survey in 1984-84 of 37,422 households found that in 70.1 of the cases, land was distributed according to household size, in 7.7 per cent according to the number of workers in the household and in 21.3 per cent, using a combination of the two. In 0.4 per cent of the cases the basis was level of technology. The distribution of land for non-crop purposes – forest-land, fishing areas and grassland - was also done using similar principles. Kojima (1993) has elaborately discussed issues in this regard.

7 The four types were (i) single item contract system for motorised wells, small pumping stations etc., (ii) Total contract system for overall management of wells, reservoirs, drinking water facilities etc., (iii) seasonal contract system for mobilisation of irrigation teams during periods of irrigation and (iv) specialised contract system whereby brigades (or group of individuals in certain cases) were made responsible for profits and losses. (Kojima, 1993: 103-104).

8 There were very important differences between the two systems. The former was closer to the earlier system in terms of planning, provision of inputs and the distribution of output or work points and the latter more radical and involved distribution of tools, implements, draught animals and mechanised equipment among the households. Riskin (1988: 287-88) discusses these two systems in detail.

1950s and the decentralization exercises of the early sixties, in terms of initiatives at the ground level preceding official formulation and sanction.[9] By the beginning of 1985 almost 98 per cent of total household across China had adopted some form of output responsibility systems but the *baogandaohu*was the dominant form (96.56 per cent).[10]

The contracted land–with entitlement to user rights only-had an initial lease period in 1979 of 3 years that was extended to 15 years in 1984 and further to 30 years in 1993. But this was not subject to changes in family size and transferable only under certain conditions. The main debate at the turn of the century concerning agriculture was land tenure–whether to institute ownership and selling rights or maintain the system of user rights entitlements with the freedom of transferability of the same.[11]

The second phase of reforms beginning (1985-86) went further in the direction of commercialization of agriculture and the rural economy as a whole.[12] The policy of compulsory purchase of agricultural produce by the state was replaced with voluntary contracts. This reform was outlined in an important publication by the CCPCC (Chinese Communist Party Central Committee) and the State Council, titled *Ten Policies for the Reinvigoration of the Rural Economy*.[13] Quotas for vegetables, aquatic products and poultry were abolished and for other crops, the ratio of quota and above-quota quantities was reversed-30 per cent of the contracted quantity was henceforth to be procured at the list (or the lower procurement) price while the remaining 70 per cent at higher prices.[14] Amongst the other issues that the publication addressed, the more important one was the structural adjustment of the agricultural and rural economies in three aspects; within and between grain and non-grain crops, where

9 Agricultural de-collectivization had occurred in parts of China during the early 1960s and households were allotted plots for contract cultivation in anticipation of official sanction (Riskin, 1988: 170-172). Similarly, by the end of 1979 about 16 per cent of production teams in Anhui province had adopted contract farming (Walker, 1984: 787).

10 Kueh (1984b) discusses in detail the different forms of responsibility systems.

11 See Ding (2000) for a discussion on the potential for further reform and the arguments for and against proposals with regard to land tenure, state procurement of grains and other issues in agriculture. Ding notes that by the late 1990s, only 62 per cent of villages had fully implemented extended land tenure and only 20 of these have actually extended the contract for the full 30 years. A third phase of reforms was planned towards the end 1980s and the early 1990s, centred around wages and prices under the policy slogan "State regulates the market, the market guides enterprise". But this was postponed due to overheating of the economy and price inflation (see Kojima, 1993).

12 The second phase of reforms that dismantled the three-decade old monopoly purchase and marketing system, is the real watershed in agricultural reform according to Ash (1993: 13).

13 See *Summary of World Broadcasts,* 27 March 1985 for an English translation.

14 For cotton, the ratio was 40:60 in the southern provinces and 30:70 for North China (Ash, 1993: 43, footnote 42).

development was to be guided by the principle of comparative advantage; between crop farming and other branches of agriculture; and thirdly between agricultural and non-agricultural activities.

In 1979, procurement quota prices for grain were increased by 20 per cent for the contracted quantity with a 30-50 per cent rise for additional supplies (above quota sales). This dual track pricing system was intended, on the one hand, to enable state procurement at lower prices and ensure a higher floor for the market price. Overall procurement levels were brought down by almost 6 per cent to 35 million metric tons. In the same year quota procurement prices of oilseeds, cotton, sugar-crops and live hogs were also raised by 24 per cent, 15.2 per cent, 26 per cent and 26.4 per cent respectively, with a corresponding increase in above quota prices.[15] In the following two decades there were repeated upward revisions in prices of several agricultural products in response to fluctuations in production and marketed quantities. For instance, in 1993 the dual track pricing system was abolished, but steep increases in grain prices in 1994 led to a reversion to the earlier system, with an increase in administered prices of cereal by 40 per cent and 42 per cent in 1996. Further, the pre-reform policy of local grain sufficiency was re-introduced in a varied form in 1994, with the institution of the 'Governor Grain Responsibility System'. Under this system, provincial governors were responsible for food self-sufficiency and price stability in their provinces. Ding (2000) argues that this led to overstocking of grain in some provinces and prices were depressed.[16]

Administrative decentralization was also undertaken as part of the institutional changes. In the place of RPCs, the townships became the basic unit of government administration[17], as a result of which by 1984, 54103 out of the 54352 RPCs (in 1982) were disbanded and the number of townships, which was negligible, rose to 91171.[18] The early reforms at the county (xian) level represented an attempt at an optimum degree of decentralization, that not only granted increased decision-making authority to the local government, but also did not seriously distort the planned allocation of resources by central authorities.[19] After the initial reforms of the early 1980s, in the early 1990s, another phase of reforms began to be implemented, that

15 For oilseeds, the above quota prices were increased between 30 and 50 per cent, for cotton 30 per cent with a further subsidy in North China. (Sicular, 1988)

16 Ding (2000) argues that the main reason for state procurement (of roughly 50 million tons in the late 1990s) is control over the grain market and to ensure a minimum strategic reserve.

17 Townships had earlier been abolished in 1962.

18 See Ash (1993: 20, Table 1.3).

19 Kueh (1984b) examines in detail the initial reforms as regards the county level government's administrative and economic functions and authority. Collective enterprises were a significant component of production units and the reforms also addressed incentive mechanisms as regards profit sharing

focused on strengthening macroeconomic management and weakening sectorial fragmentation by a comprehensive administrative reform at the county level. But this led to concentration of power with county governments, leading to widespread illegal revenue appropriations from the farming sector in various forms–taxes, levies, charges etc. Further, rural government departments were fragmented, and with staff redundancy and decline in funding, contributed to overall operational inefficiency. In 1991, improvements in rural living standards and farm mechanization were emphasized at the 8th plenum of the 13th CCPCC[20], along with the establishment of a "socialized service system" for peasants. In the late 1990s and early 2000s, there was an official acknowledgment of environmental degradation and the risks to agriculture, though no specific reforms were formulated to address them.

Beginning in 1979, reforms were also introduced in the industrial sector, bringing in responsibility systems and expanding the autonomy of the enterprises, similar to those in the agricultural sector. An enterprise fund was set up in the State Owned Enterprises (SOEs) financed from profits that were retained, which was to serve as an incentive to award bonuses and innovations. Within a year, 6600 SOEs were selected for reform experiments and in 1983, the compulsory profit delivery was replaced with income tax payments.[21] Enterprise autonomy as regards production decisions were introduced in 1984 to eventually replace physical input and output targets within a two-track system, that allowed enterprises to operate for both the plan and the market in production, investment and pricing. In the same year, the major industrial reform with a direct impact on rural China, concerned the Commune and Brigade enterprises, which were renamed Township and Village industries (TVEs). TVEs were permitted to engage in a wide range of products that satisfied both consumer and producer demands. Also in 1984, fourteen coastal cities and three regions were opened up for foreign investment with incentives that included tax benefits. Wage reforms (linking wage bill to realized profits besides autonomy as regards fixing wages) and a phasing out of industrial products under the control of the State Planning Commission, were initiated in 1985. The first major attempt at price liberalization was also undertaken in that year, resulting in the first wave of inflation (averaging 8.5 per cent, 6 per cent and 7.3 per cent in the three years between 1985 and 1987). The major official pronouncement on the role of the market was made in 1987, with the key slogan, "let the government regulate the market; let the market guide the enterprises". Private sector was recognized as a necessary supplement to the state sector.

20 These were outlined in the document "Decisions on Further Strengthening Agricultural and Rural Work"

21 These 6600 enterprises comprised mostly large and medium sized units accounting for 60 per cent of Gross Value of Industrial Output (GVIO) and 70 per cent of enterprise profits. See Howe et.al. (2003) for a detailed examination of the reform process until 2000, with a study of official documents.

The next major reform that directly concerned the industrial sector was in 1992, with the decision to open up China to the international markets for trade as well as investment. The declared goal of the reforms was the establishment of a "socialist market economy". Wide-ranging reforms in finance and taxation, money and banking and foreign exchange systems were initiated in late 1993, resulting in higher inflation levels of 21.7 per cent and 14.8 per cent in 1994 and 1995 respectively. By 1996, prices of about 80 per cent of producer goods, 85 per cent of agricultural commodities and 95 per cent of industrial consumer goods, were subject to market forces. 2001 marked the entry of China in to the World Trading Organization. In 2004, the Chinese constitution was amended to provide protection for private property.

While reforms have fundamentally altered the character of the Chinese economy, with market mechanisms determining production and investment, the role of the Chinese state has been gradually restricted to regulating the market with macroeconomic fiscal and monetary policies, besides other regulatory devices.

5.2 STRUCTURAL CHANGE AND ECONOMIC GROWTH UNDER REFORMS

In this section, the discussion focuses on structural change since 1978 and the role of the external sector in the trajectory of post-reform growth. The problems that emerged following reforms and rapid economic growth are treated in the final section of this chapter where broader questions relating to China's economy in general and the rural economy in particular are evaluated.

5.2a Economic Growth and Investment

Five-year averages for GDP and its sectoral components, and shares for the period 1978-2009 at 1978 (comparable) prices, are compiled in Table 5.1b. and T5.1a respectively . The sectoral composition of GDP in Table 5.1a reveals rapid structural change in terms of the shares of primary, secondary and tertiary sectors. Though value added by the primary sector doubled during 1978-94, its share in GDP shrank by half, from over 41 per cent during 1978/79 to 24 per cent during 1990-94 and further to 10 per cent for the period 2005-09 (For 2009 the figure was 9 per cent). The period of rapid decline began towards the late 1980s when the share of manufacturing (industry) began expanding rapidly. The share of the construction sector has remained stable at around 5-6 per cent throughout the entire period, while that of the tertiary sector expanded until late 1980s and early 1990s and subsequently fell after the 1990s (See Chart 5.2). Chart 5.1 (depicting the data in

table A5.1) clearly shows the rapid growth of all the sectors in the initial phase of reforms until 1985. The primary sector comprising farming, animal husbandry, forestry and fisheries however, grew much slower than the other sectors. There is also a clear inflection for all the sectors during the late 1980s and early 1990s, which was a period of high rates of inflation. In fact, inflationary pressures emerged in a cyclical pattern throughout the period since the late 1980s.

Table 5.1a: Sectoral Share in GDP, 1978-2009 (per cent)

	Primary Sector	Secondary Sector			Tertiary Industry
		Total	Industry	Constrn.*	
1978-79	41.0	32.3	27.6	5.2	31.1
1980-84	37.8	32.6	27.5	5.7	33.2
1985-89	29.8	34.2	28.8	6.3	39.1
1990-94	24.1	38.5	33.0	5.9	39.0
1995-99	17.5	44.7	38.9	6.0	37.8
2000-04	13.5	46.7	41.2	5.5	39.8
2005-09	10.0	48.8	42.7	6.1	41.3

* Constrn.–Construction; Source: Table A5.1

Table A5.1: China: Gross Domestic Product by Sector, 1978-2009, 100 Million Yuan at Comparable 2000 Prices

	Gross National Income	Gross Domestic Product	Primary Industry	Secondary Sector			Tertiary Industry	GDP Per Capita (yuan)	Sectoral share in GDP (%)				
									Primary Industry	Secondary			Tertiary Industry
				Total	Industry	Construction				Total	Industry	Construction	
1978	13055	13055	5395	4211	3580	691	4049	1365	41.3	32.3	27.4	5.3	31.0
1979	14048	14048	5724	4557	3891	705	4367	1449	40.7	32.4	27.7	5.0	31.1
1980	15145	15145	5641	5175	4382	893	4629	1543	37.2	34.2	28.9	5.9	30.6
1981	15933	15940	6035	5271	4459	921	5112	1604	37.9	33.1	28.0	5.8	32.1
1982	17406	17383	6731	5564	4716	953	5775	1723	38.7	32.0	27.1	5.5	33.2
1983	19344	19270	7291	6141	5174	1116	6651	1883	37.8	31.9	26.9	5.8	34.5
1984	22304	22194	8231	7031	5943	1237	7938	2141	37.1	31.7	26.8	5.6	35.8
1985	25252	25183	8382	8336	7025	1511	9380	2396	33.3	33.1	27.9	6.0	37.2
1986	27408	27411	8660	9188	7702	1751	10510	2569	31.6	33.5	28.1	6.4	38.3
1987	30565	30586	9068	10446	8722	2064	12019	2821	29.6	34.2	28.5	6.7	39.3
1988	34022	34036	9299	11963	10053	2229	13600	3090	27.3	35.1	29.5	6.5	40.0
1989	35437	35419	9584	12413	10561	2041	14329	3166	27.1	35.0	29.8	5.8	40.5
1990	36878	36779	10287	12807	10915	2065	14664	3240	28.0	34.8	29.7	5.6	39.9
1991	40237	40154	10534	14581	12486	2263	15965	3489	26.2	36.3	31.1	5.6	39.8
1992	45896	45873	11029	17666	15129	2738	17951	3938	24.0	38.5	33.0	6.0	39.1
1993	52169	52278	11547	21175	18168	3231	20139	4436	22.1	40.5	34.8	6.2	38.5
1994	59007	59117	12009	25063	21604	3673	22373	4960	20.3	42.4	36.5	6.2	37.8
1995	64515	65575	12610	28541	24638	4128	24574	5443	19.2	43.5	37.6	6.3	37.5
1996	71090	72138	13253	31996	27719	4480	26890	5925	18.4	44.4	38.4	6.2	37.3
1997	77935	78845	13717	35349	30857	4597	29772	6410	17.4	44.8	39.1	5.8	37.8

	Gross National Income	Gross Domestic Product	Primary Industry	Secondary Sector			Tertiary Industry	GDP Per Capita (yuan)	Sectoral share in GDP (%)				
									Primary Industry	Secondary			Tertiary Industry
				Total	Industry	Construction				Total	Industry	Construction	
1998	83633	85021	14197	38498	33603	5011	32265	6846	16.7	45.3	39.5	5.9	37.9
1999	90278	91500	14594	41631	36465	5226	35275	7304	16.0	45.5	39.9	5.7	38.6
2000	98000	99215	14945	45556	40034	5522	38714	7858	15.1	45.9	40.4	5.6	39.0
2001	105895	107450	15363	49401	43505	5897	42685	8448	14.3	46.0	40.5	5.5	39.7
2002	116003	117208	15809	54257	47842	6415	47142	9154	13.5	46.3	40.8	5.5	40.2
2003	128343	128959	16204	61133	53942	7190	51622	10009	12.6	47.4	41.8	5.6	40.0
2004	141706	141964	17225	67926	60151	7775	56814	10953	12.1	47.8	42.4	5.5	40.0
2005	158765	158021	18126	76133	67115	9018	63762	12121	11.5	48.2	42.5	5.7	40.4
2006	179047	178052	19032	86328	75756	10572	72777	13581	10.7	48.5	42.5	5.9	40.9
2007	204762	203269	19745	99332	87049	12283	84409	15424	9.7	48.9	42.8	6.0	41.5
2008	224402	222853	20807	109144	95694	13450	93190	16823	9.3	49.0	42.9	6.0	41.8
2009	245274	243162	21677	119993	104048	15946	101878	18264	8.9	49.3	42.8	6.6	41.9

Note: For definitions of GNI and GDP see footnote to text in section 5.2.

Source data: China Statistical Yearbook, various issues until 2010.

Table A5.2: China: Population by Residence and Employment by Sector, 1978-2009, Millions

	Total Population	Population by Residence				Econ. Active Population	Employment by Sector				Proportions		
		Rural	Urban	Proportion			Total	Primary	Secondary	Tertiary			
				Rural	Urban						Primary	Secondary	Tertiary
1978	962.6	790.1	172.5	82.1	17.9	406.8	401.5	283.2	69.5	48.9	70.5	17.3	12.2
1979	975.4	790.5	185.0	81.0	19.0	415.9	410.2	286.3	72.1	51.8	69.8	17.6	12.6
1980	987.1	795.7	191.4	80.6	19.4	429.0	423.6	291.2	77.1	55.3	68.7	18.2	13.1
1981	1000.7	799.0	201.7	79.8	20.2	441.7	437.3	297.8	80.0	59.5	68.1	18.3	13.6
1982	1016.5	801.7	214.8	78.9	21.1	456.7	453.0	308.6	83.5	60.9	68.1	18.4	13.5
1983	1030.1	807.3	222.7	78.4	21.6	467.1	464.4	311.5	86.8	66.1	67.1	18.7	14.2
1984	1043.6	803.4	240.2	77.0	23.0	484.3	482.0	308.7	95.9	77.4	64.0	19.9	16.1
1985	1058.5	807.6	250.9	76.3	23.7	501.1	498.7	311.3	103.8	83.6	62.4	20.8	16.8
1986	1075.1	811.4	263.7	75.5	24.5	515.5	512.8	312.5	112.2	88.1	60.9	21.9	17.2
1987	1093.0	816.3	276.7	74.7	25.3	530.6	527.8	316.6	117.3	94.0	60.0	22.2	17.8
1988	1110.3	823.7	286.6	74.2	25.8	546.3	543.3	322.5	121.5	99.3	59.3	22.4	18.3
1989	1127.0	831.6	295.4	73.8	26.2	557.1	553.3	332.3	119.8	101.3	60.1	21.6	18.3
1990	1143.3	841.4	302.0	73.6	26.4	653.2	647.5	389.1	138.6	119.8	60.1	21.4	18.5
1991	1158.2	846.2	312.0	73.1	26.9	660.9	654.9	391.0	140.2	123.8	59.7	21.4	18.9
1992	1171.7	850.0	321.8	72.5	27.5	667.8	661.5	387.0	143.6	131.0	58.5	21.7	19.8
1993	1185.2	853.4	331.7	72.0	28.0	674.7	668.1	376.8	149.7	141.6	56.4	22.4	21.2
1994	1198.5	856.8	341.7	71.5	28.5	681.4	674.6	366.3	153.1	155.2	54.3	22.7	23.0
1995	1211.2	859.5	351.7	71.0	29.0	688.6	680.7	355.3	156.6	168.8	52.2	23.0	24.8
1996	1223.9	850.9	373.0	69.5	30.5	697.7	689.5	348.2	162.0	179.3	50.5	23.5	26.0
1997	1236.3	841.8	394.5	68.1	31.9	708.0	698.2	348.4	165.5	184.3	49.9	23.7	26.4
1998	1247.6	831.5	416.1	66.7	33.4	720.9	706.4	351.8	166.0	188.6	49.8	23.5	26.7
1999	1257.9	820.4	437.5	65.2	34.8	727.9	713.9	357.7	164.2	192.1	50.1	23.0	26.9
2000	1267.4	808.4	459.1	63.8	36.2	739.9	720.9	360.4	162.2	198.2	50.0	22.5	27.5
2001	1276.3	795.6	480.6	62.3	37.7	744.3	730.3	365.1	162.8	202.3	50.0	22.3	27.7
2002	1284.5	782.4	502.1	60.9	39.1	753.6	737.4	368.7	157.8	210.9	50.0	21.4	28.6
2003	1292.3	768.5	523.8	59.5	40.5	760.8	744.3	365.5	160.8	218.1	49.1	21.6	29.3
2004	1299.9	757.1	542.8	58.2	41.8	768.2	752.0	352.7	169.2	230.1	46.9	22.5	30.6
2005	1307.6	745.4	562.1	57.0	43.0	778.8	758.3	339.7	180.8	237.7	44.8	23.8	31.4

	Total Population	Population by Residence				Econ. Active Population	Employment by Sector				Proportions		
		Rural	Urban	Proportion			Total	Primary	Secondary	Tertiary			
				Rural	Urban						Primary	Secondary	Tertiary
2006	1314.5	737.4	577.1	56.1	43.9	782.4	764.0	325.6	192.3	246.1	42.6	25.2	32.2
2007	1321.3	727.5	593.8	55.1	44.9	786.5	769.9	314.4	206.3	249.2	40.8	26.8	32.4
2008	1328.0	721.4	606.7	54.3	45.7	792.4	774.8	306.5	211.1	257.2	39.6	27.2	33.2
2009	1334.7	712.9	621.9	53.4	46.6	798.1	780.0	297.1	216.8	266.0	38.1	27.8	34.1

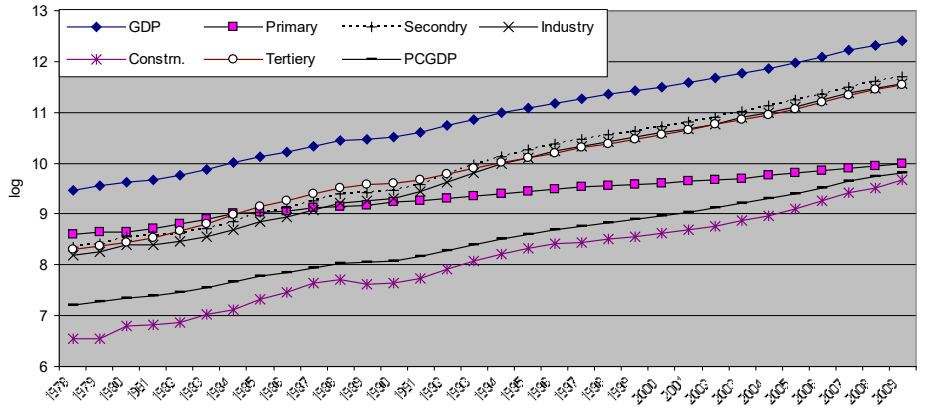
Source Data: China Statistical Yearbook, 2010

Table 5.1b: China: Gross Domestic Product by Sector, 1978-2009, 100 Million Yuan at Comparable 2000 Prices

	Gross National Income	Gross Domestic Product	Primary Industry	Secondary			Tertiary Industry	PerCapita GDP (yuan)
				Total	Industry	Constrn.*		
1978-79	13552	13552	5560	4384	3736	698	4208	1407
1980-84	18026	17986	6786	5836	4935	1024	6021	1779
1985-89	30537	30527	8999	10469	8813	1919	11968	2809
1990-94	46837	46840	11081	18258	15661	2794	18218	4013
1995-99	77490	78616	13674	35203	30657	4688	29755	6385
2000-04	117989	118959	15909	55655	49095	6560	47395	9285
2005-09	202450	201071	19877	98186	85933	12254	83203	15243
Indices (1978-79 =100)								
	GNI	GDP	Primary Sector	Secondary Sector			Tertiary Industry	PCGDP (yuan)
				Total	Industry	Constrn.*		
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	133.0	132.7	122.1	133.1	132.1	146.7	143.1	126.4
1985-89	225.3	225.3	161.9	238.8	235.9	275.0	284.4	199.6
1990-94	345.6	345.6	199.3	416.5	419.2	400.3	432.9	285.2
1995-99	571.8	580.1	246.0	803.0	820.6	671.7	707.1	453.8
2000-04	870.7	877.8	286.1	1269.5	1314.2	939.8	1126.2	659.9
2005-09	1493.9	1483.7	357.5	2239.7	2300.3	1755.6	1977.1	1083.3
5 Year Growth Rates (%)								
	GNI	GDP	Primary Sector	Secondary Sector			Tertiary Industry	PCGDP (yuan)
				Total	Industry	Constrn.*		
1978/79-1980-84	33.0	32.7	22.1	33.1	32.1	46.7	43.1	26.4
1980/84-1985/89	69.4	69.7	32.6	79.4	78.6	87.4	98.8	57.9
1990/94-1995/99	53.4	53.4	23.1	74.4	77.7	45.6	52.2	42.9
1990/94-1995/99	65.4	67.8	23.4	92.8	95.8	67.8	63.3	59.1
1995/99-2000/4	52.3	51.3	16.3	58.1	60.1	39.9	59.3	45.4
2000/04-2005/09	71.6	69.0	24.9	76.4	75.0	86.8	75.6	64.2
Compound Growth Rates (%)								
	GNI	GDP	Primary	Secondary Sector			Tertiary	PCGDP (yuan)
				Total	Industry	Constrn.*		
1978/79-1980-84	8.5	8.4	5.9	8.5	8.3	11.6	10.8	6.9
1980/84-1985/89	11.1	11.2	5.8	12.4	12.3	13.4	14.7	9.6
1990/94-1995/99	8.9	8.9	4.3	11.8	12.2	7.8	8.8	7.4
1990/94-1995/99	10.6	10.9	4.3	14.0	14.4	10.9	10.3	9.7
1995/99-2000/4	8.8	8.6	3.1	9.6	9.9	6.9	9.8	7.8
2000/04-2005/09	11.4	11.1	4.6	12.0	11.8	13.3	11.9	10.4

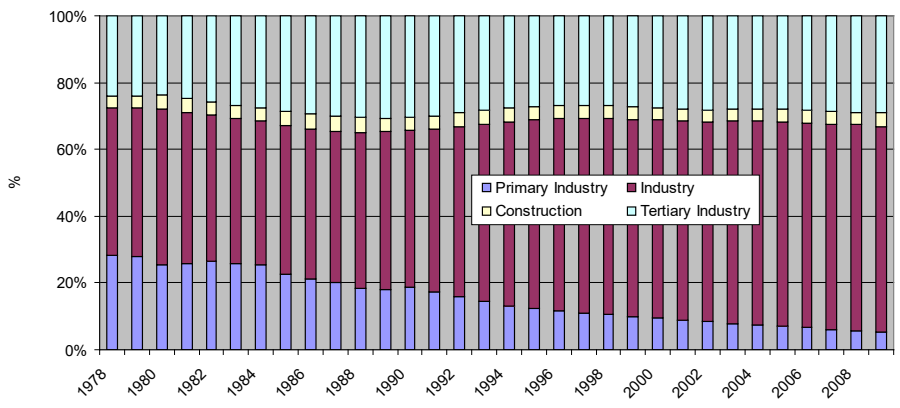
*Constrn–Construction; *Source:* Table A5.1a

Chart 5.1 China: Trends in GDP and its components, 1978-2009



Comparable 2000 prices, Source data: Table 5.1

Chart 5.2. China: Sectoral shares in GDP, 1978-2009



Source: Table 5.1

The trend of sectoral growth rates (estimated using OLS) for the entire period and sub-periods, are presented in Table 5.1c This table also includes the components of the tertiary sector as well as the components of the external economy.

Except in the case of the primary sector, for all sectors and sub-sectors, the growth rates were higher in the period post-1985 (compared to pre-1985). In other words, taking the farming, forestry, fisheries and animal husbandry sectors together, there was a spurt in rapid growth in the initial phase of reforms (1978-85) close to 7 per cent per annum, but this rate fell to a little over 6 per cent over the extended

period–1978-88, and further to less than 4 per cent between 1991 and 2009. For the entire period, annual average growth rate of the primary sector was 4.3 per cent, far below all other sectors and sub-sectors. A more detailed examination of agriculture and allied activities is taken up in the next section.

Table 5.1c: China: GDP and Sectoral Annual Trend Growth Rates 1978-2009 (%)

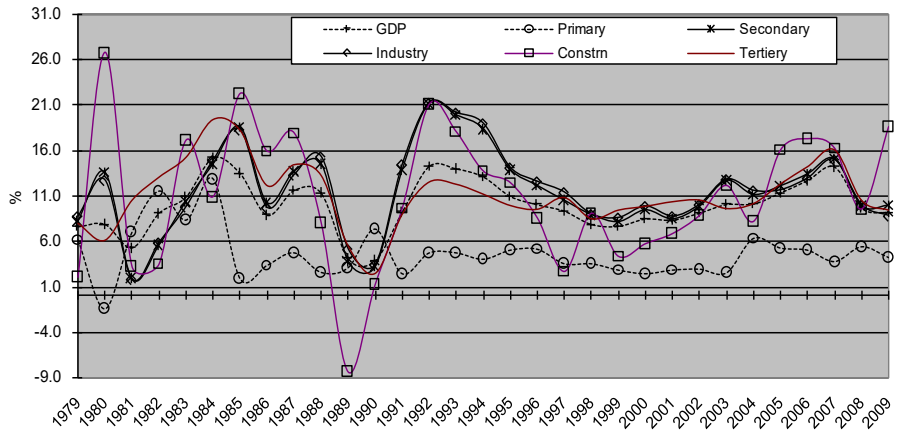
	1978-85	1985-91	1991-2009	1985-95	1995-2009	1978-2009
Gross National Income	9.2	7.6	9.6	9.2	9.6	9.5
Gross Domestic Product	9.2	7.6	9.5	9.3	9.3	9.5
Primary Sector	6.9	3.9	3.8	4.1	3.7	4.3
Secondary Sector	8.9	9.0	10.9	12.0	10.2	11.2
Industry (manufacturing)	8.8	9.3	11.1	12.4	10.3	11.3
Construction	10.7	5.5	9.5	9.0	9.5	9.6
Tertiary Sector	12.0	8.7	10.1	9.1	10.2	10.3
PCGDP	7.8	6.1	8.7	7.9	8.7	8.4
Tertiary Sector, Growth Rates (%)						
	1978-85	1985-91	1991-2009	1985-95	1995-2009	1978-2009
Tertiary	12.0	8.7	10.1	9.1	10.2	10.2
Transport, Storage, Post & Communication	8.3	8.9	9.4	9.3	9.2	9.6
Wholesale and Retail Trade	13.9	2.9	9.6	4.4	10.3	8.7
Hotels and Catering Services	14.3	11.5	10.5	12.9	10.0	11.5
Financial Intermediation	17.9	16.0	8.9	11.6	9.6	11.2
Real Estate	8.7	15.1	9.1	15.1	9.1	11.8
Other Tertiary services	11.6	7.2	11.5	9.5	11.3	10.8
The External Sector						
	1982-91	1985-91	1999-2009	1985-95	1995-2009	1991-2009
Exports	12.3	14.9	21.3	15.8	18.5	18.0
Imports	12.0	5.3	19.9	11.4	18.0	17.0
Avg. Net Foreign Direct Investment*	17.2	21.7	576.1	101.0	525.6	449.5

Note: Avg. Net FDI*-Annual average Foreign Direct Investment in US$ million, for the respective period.
Source: Table A5.1, 5.2e& *China Statistical Yearbook* various years

Chart 5.3 plots the annual growth rates of GDP and its sectoral components. Between 1998 and 2002, there was a slowdown in the growth of all sectors relative to the period 1991-97, when China was vigorously opening up to foreign investment and trade. The secondary sector grew at over 20 per cent on average during 1992-94, with the rate falling to about 12 per cent during 1995-97. Following the Asian

financial crisis of 1997-98, the rates fell below 10 per cent until 2002. The decline in growth of the primary sector was more severe, particularly during 1999-2003 when the annual rates fell below 3 per cent. Chart 5.3 also reveals a higher volatility as regards annual changes in value added in all the sectors prior to 1993.

Chart 5.3 Annual sectoral growth rates - China 1979-2008



Comparable 2000 prices, Source data: CSY 2010

The growth of the tertiary sector was second only to manufacturing over the entire period. This sector grew at 10.25 per cent over 1978-2009 and the rate was even higher during 1978-88. Table 5.1d presents the shares of the components of the tertiary sector where it can be seen that domestic trade was the dominant service activity even though in terms of value added this sub-sector's did not grow as rapidly as banking and finance, real estate and catering (see Table 5.1c). The more important aspect of the tertiary sector is the residual category–*others*–which besides accounting for more than a third of value added, also grew consistently over the sub-periods at around 10.5 per cent p.a. The other tertiary sectors grew more rapidly in the first decade of reform (excepting transport, storage and post and communications in the period 1985), than in the 1990s and 2000s.

Following the reforms, the overall high growth rates of almost all the sectors (except agriculture and grain cultivation particularly post-1985), must however be placed in the context of one important macroeconomic legacy of pre-reform China-namely the high priority to investment over consumption.

Table 5.1d: China: Components of Tertiary Sector, 1978-2009 (%)

	Total Tertiary Industry	Transport Storage and Post & communications	Wholesale and Retail Trades	Hotels Catering Services	Financial Interme-diation	Real Estate	Others
1978	100	19.4	28.0	3.7	6.7	8.2	33.8
1979	100	19.5	28.2	3.8	6.1	7.9	34.5
1980	100	19.2	26.1	3.7	6.1	8.1	37.5
1981	100	17.7	30.6	4.0	5.8	7.0	36.5
1982	100	17.5	26.9	4.6	7.4	6.8	36.7
1983	100	16.6	28.3	4.8	8.1	6.2	35.7
1984	100	16.0	29.6	4.4	8.9	6.6	34.6
1985	100	15.4	33.4	3.9	8.8	7.0	32.7
1986	100	15.6	32.7	4.0	10.4	7.9	30.0
1987	100	15.0	32.8	3.9	11.2	8.9	29.0
1988	100	14.9	32.4	4.3	11.8	8.9	28.0
1989	100	14.7	27.4	4.5	14.1	9.8	27.9
1990	100	15.6	25.4	4.5	14.0	10.2	28.3
1991	100	15.8	24.5	4.5	13.2	10.5	30.0
1992	100	15.5	24.1	5.1	12.7	12.5	29.8
1993	100	15.6	23.3	4.9	12.5	12.4	31.0
1994	100	15.2	22.7	5.6	12.3	12.5	31.5
1995	100	15.4	22.4	5.6	12.2	12.8	31.6
1996	100	15.6	22.0	5.5	12.0	12.1	32.6
1997	100	15.4	21.6	5.5	11.7	11.4	34.1
1998	100	15.7	21.3	5.6	11.3	11.3	34.5
1999	100	16.1	21.1	5.6	10.9	11.0	35.2
2000	100	15.9	21.1	5.5	10.6	10.7	36.2
2001	100	15.7	20.9	5.4	10.2	10.8	37.1
2002	100	15.2	20.5	5.5	9.9	10.7	38.1
2003	100	14.8	20.6	5.6	9.6	10.8	38.6
2004	100	15.4	20.0	5.8	9.1	10.4	39.5
2005	100	15.2	20.1	5.8	9.2	10.4	39.3
2006	100	14.7	21.1	5.7	10.2	10.5	38.2
2007	100	14.1	21.8	5.4	11.2	11.2	36.6
2008	100	13.7	22.9	5.3	11.5	10.3	36.8
2009	100	13.0	23.5	5.1	12.4	10.5	36.2

Source: China Statistical Yearbook, various years

Throughout the reform period, investment rates (as a share of GDP) were higher and increasing relative to pre-reform levels. This was also accompanied by vast inflows of foreign direct investment since the early 1990s, which is examined in a sub-section below. Table 5.1e presents time-series data on capital formation, savings and consumption for the entire post-reform period. The general trend for all the variables in the table until 1990 was similar in that they expanded at roughly the same rates. Relative to 1978, both savings and investment expanded 2.4 times whereas consumption expanded roughly 2.7 times (2.8 in the case of government

consumption). In the subsequent period, gross fixed capital formation grew at a much faster rate than gross domestic savings.

Table 5.1e: China: Savings, Capital Formation and Consumption, 1978-2009 (100 million constant Yuan)

	Gross Domestic Savings (GDS)	Gross Fixed Capital Formation (GFCF)	House-hold Consumption (HHC)	Govern-ment Consum-ption (GC)	Share in GDP (%)			
					GDS	GFCF	HHC	GC
1978	5924	3939	7125	1940	37.3	29.5	49.5	13.2
1979	6087	4070	7670	2369	35.5	28.4	49.2	15.3
1980	6669	4564	8452	2454	34.8	29.1	50.3	14.9
1981	7023	4511	9160	2554	33.8	27.4	51.2	15.0
1982	7778	4931	9934	2786	35.9	28.2	48.9	15.3
1983	8155	5592	11116	3081	35.3	28.9	49.7	15.0
1984	9081	6676	12622	3728	34.9	29.8	49.8	15.3
1985	9829	7930	14992	4155	34.3	29.6	51.3	14.4
1986	10660	8592	15773	4527	35.9	30.6	49.3	14.8
1987	12264	9832	17328	4746	37.1	31.5	49.0	13.9
1988	13050	10691	19187	4797	36.6	31.3	50.3	13.1
1989	13144	9212	19386	5184	35.8	26.0	50.3	13.8
1990	14459	9475	19740	5503	39.1	25.9	46.7	14.1
1991	15233	10838	20990	6592	39.2	27.9	45.4	15.4
1992	16306	13457	24171	7801	38.6	31.6	45.7	15.6
1993	19757	17470	27058	9068	41.8	37.7	42.7	15.5
1994	23699	19801	28728	9730	43.5	35.9	41.1	15.3
1995	26671	21792	32087	9476	43.5	34.4	42.7	13.8
1996	28661	23992	35317	10371	42.5	33.8	43.5	14.0
1997	31241	25929	36974	11232	42.4	32.9	43.4	14.2
1998	32675	28817	39281	12405	41.4	33.8	44.0	14.6
1999	34119	30758	42613	13978	39.4	34.0	45.3	15.3
2000	37699	33844	45855	15661	37.5	34.1	46.7	15.8
2001	41767	36926	48512	17171	38.4	34.4	45.7	16.0
2002	47241	41799	51705	18282	40.4	36.3	44.0	15.6
2003	54742	48642	55070	19139	43.4	39.4	41.8	14.8
2004	62576	54306	59145	20254	45.8	40.7	40.2	14.0
2005	72385	60592	62811	22823	47.6	40.1	38.1	14.3
2006	84299	68131	68367	25421	50.7	40.7	35.2	14.1
2007	99500	77041	75518	28356	50.5	39.1	36.0	13.5
2008	110206	84529	81808	30884	51.8	40.8	34.9	13.3
2009	120911	103636	89503	32768	52.1	45.6	34.9	13.0
Growth Rates								
1978-1990	7.9	9.1	9.4	8.8				
1991-2009	11.2	11.2	7.5	8.6				
1978-2009	9.7	10.6	8.0	9.0				

Source: World Development Indicators Database, the World Bank

As regards consumption, household consumption lagged behind government consumption since the early 1990s–the former grew at an annual rate of 7.5 per cent and 8 per cent during 1991-2009 and 1978-2009 respectively, whereas government consumption grew at 8.6 per cent and 9 per cent in the respective periods. This is also reflected in their shares in GDP–that of household consumption remained close to 50 per cent until 1989, but fell to an average of 45 per cent thereafter until 2002 and fell further to less than 35 per cent by 2008-09. Government share of a rising GDP remained within a range of 13-16 per cent over the entire period, though it was at lower levels during 2008-09. Clearly, growth in post-reform China owes as much to the rise in investment on the domestic front as to the external sector after the mid-1990s. (This is discussed in a later sub-section)

5.2b Employment

Table 5.2a presents the broad demographic shifts and changes in the employment profile for the period 1978-2009 (by 5-year grouped data) that displays both increased urbanization as well as structural change. Though there were net additions to the primary sector employment of 108 million persons, the share in total employment gradually declined from 70 per cent during 1978-79 to about 50 per cent by the end of 1990s (Table 5.2b). With net declines after 1991, the share fell by about a further 10 percentage points to average 41 per cent during 2004-09.

Table 5.2a: China: Population by Residence and Employment by Sector, 1978-2009, Millions

	Population by Residence			Proportion (%)		Economically Active Population	Employed Persons			
	Total	Rural	Urban	Rural	Urban		Total	Primary	Secondary	Tertiary
1978-79	969.0	790.3	178.7	81.6	18.4	411.4	405.9	284.8	70.8	50.3
1980-84	1015.6	801.4	214.2	78.9	21.1	455.8	452.0	303.6	84.7	63.8
1985-89	1092.8	818.1	274.7	74.9	25.1	530.1	527.2	319.0	114.9	93.3
1990-94	1171.4	849.6	321.8	72.5	27.5	667.6	661.3	382.0	145.0	134.3
1995-99	1235.4	840.8	394.6	68.1	31.9	708.6	697.7	352.3	162.9	182.6
2000-04	1284.1	782.4	501.7	60.9	39.1	753.4	737.0	362.5	162.6	211.9
2005-09	1321.2	728.9	592.3	55.2	44.8	787.6	769.4	316.7	201.5	251.2
Indices										
	Population			Proportion (%)			Employed Persons			
	Total	Rural	Urban	Rural	Urban	Econ. Act. Pop	Total	Primary	Secondary	Tertiary
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	104.8	101.4	119.8	96.8	114.2	110.8	111.4	106.6	119.6	126.8
1985-89	112.8	103.5	153.7	91.8	136.2	128.9	129.9	112.0	162.3	185.3
1990-94	120.9	107.5	180.1	88.9	148.9	162.3	162.9	134.2	204.8	266.7
1995-99	127.5	106.4	220.8	83.5	173.1	172.3	171.9	123.7	230.0	362.8
2000-04	132.5	99.0	280.7	74.7	211.8	183.1	181.6	127.3	229.6	421.0
2005-09	136.3	92.2	331.4	67.7	243.1	191.5	189.6	111.2	284.6	499.1

5 Year Growth Rates (% change)										
	Population			Proportion (%)			Employed Persons			
	Total	Rural	Urban	Rural	Urban	Econ. Act. Pop	Total	Primary	Secondary	Tertiary
1978/79-1980-84	4.8	1.4	19.8	-3.2	14.2	10.8	11.4	6.6	19.6	26.8
1980/84-1985/89	7.6	2.1	28.3	-5.1	19.2	16.3	16.6	5.1	35.7	46.1
1990/94-1995/99	7.2	3.8	17.2	-3.1	9.3	25.9	25.4	19.7	26.2	44.0
1990/94-1995/99	5.5	-1.0	22.6	-6.1	16.2	6.1	5.5	-7.8	12.3	36.0
1995/99-2000/4	3.9	-6.9	27.1	-10.5	22.4	6.3	5.6	2.9	-0.2	16.1
2000/04-2005/09	2.9	-6.8	18.1	-9.5	14.8	4.5	4.4	-12.6	23.9	18.6

Source: Table A5.2

The tertiary sector absorbed a proportionately larger share of total additions to employment over the entire period of 1978-2009–the share increasing from just 12 per cent in 1978 to about 20 per cent during 1990-94 and further to about 33 per cent during 2005-09. The secondary sector accounted for the balance–its share increasing from a little over 17 per cent in 1978, to 22 per cent during 1990-94, and further to 26 per cent during 2005-09. Between 1998 and 2004, the share of the secondary sector fell marginally and the 1997 share of 23.7 per cent was attained again only in 2005 (Table A5.2). The reason for the decline in this period can be attributed to the restructuring and reforms of collective and state industrial enterprises.

Table 5.2b: China: Share of Economically Active Population in Total Population and Sectoral Shares of Employment (%)

	Share in Total Population %	Share in Total Employment		
	Econ. Act. Pop	Primary	Secondary	Tertiary
1978-79	42.5	70.2	17.5	12.4
1980-84	43.1	67.2	18.7	14.1
1985-89	43.8	60.5	21.8	17.7
1990-94	44.5	57.8	21.9	20.3
1995-99	45.1	50.5	23.3	26.2
2000-04	45.9	49.2	22.1	28.7
2005-09	46.9	41.2	26.2	32.7

Source: Table A5.2

Table 5.2c: China: Employment by Sub-sectors 1978-2002 (10,000 persons)

	1978	1980	1985	1990	1995	1998	2000	2001	2002
Total	40152	42361	49873	64749	68065	70637	72085	73025	73740
FFAHF	28318	29122	31130	34117	33018	33232	33355	32974	32487
MQ	652	697	795	882	932	721	597	561	558
Manufacturing	5332	5899	7412	8624	9803	8319	8043	8083	8307
PSEGW	107	118	142	192	258	283	284	288	290
Construction	854	993	2035	2424	3322	3327	3552	3669	3893
GPWC	178	188	197	197	135	116	110	105	98
TSPT	750	805	1279	1566	1942	2000	2029	2037	2084
WRTCS	1140	1363	2306	2839	4292	4645	4686	4737	4969
FI	76	99	138	218	276	314	327	336	340
RE	31	37	36	44	80	94	100	107	118
SS	179	276	401	594	703	868	921	976	1094
HCSSW	363	389	467	536	444	478	488	493	493
ECARFT	1093	1147	1273	1457	1476	1573	1565	1568	1565
SRPS	92	113	144	173	182	178	174	165	163
GAPASO	467	527	799	1079	1042	1097	1104	1101	1075
Others	521	588	1319	1798	4484	5118	5643	5852	6245
Residual	-1	0	0	8009	5676	8274	9108	9972	9960
Share in Total Employment (%)									
FFAHF	70.5	68.7	62.4	52.7	48.5	47.0	46.3	45.2	44.1
MQ	1.6	1.6	1.6	1.4	1.4	1.0	0.8	0.8	0.8
Manufacturing	13.3	13.9	14.9	13.3	14.4	11.8	11.2	11.1	11.3
PSEGW	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Construction	2.1	2.3	4.1	3.7	4.9	4.7	4.9	5.0	5.3
GPWC	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1
TSPT	1.9	1.9	2.6	2.4	2.9	2.8	2.8	2.8	2.8
WRTCS	2.8	3.2	4.6	4.4	6.3	6.6	6.5	6.5	6.7
FI	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5
RE	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
SS	0.4	0.7	0.8	0.9	1.0	1.2	1.3	1.3	1.5
HCSSW	0.9	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.7
ECARFT	2.7	2.7	2.6	2.3	2.2	2.2	2.2	2.1	2.1
SRPS	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
GAPASO	1.2	1.2	1.6	1.7	1.5	1.6	1.5	1.5	1.5
Others	1.3	1.4	2.6	2.8	6.6	7.2	7.8	8.0	8.5
residual	0.0	0.0	0.0	12.4	8.3	11.7	12.6	13.7	13.5

FFAHF: Farming, forestry, animal husbandry and fisheries; PSEGW : Production and supply of electricity, gas and water supply
GPWC: Geological prospecting and water conservancy; TSPT: Transport Storage and Communications; RE: Real estate
WRTCS: Wholesale and retail trade, catering services (restaurants);FI: Financial intermediation and insurance; MQ: Mining & Quarrying SS:
social services; HCSSW: Health care, sports and social services; ECARFT: Education, culture and arts, radio, film and television;
SRPS: Scientific research and polytechnic services; GAPASO: Government agencies, party agencies and social organizations.
Source: China Statistical Yearbook various years &China Labour Yearbook various years

Rawski (1999) examined labour absorption in various organizational forms of enterprises in the period 1980-97 and found that the contribution (to labour absorption as a percentage of incremental labour force) by the collective sector was negative from 1990 onwards, whereas for the state sector a similar trend began in 1995.[22] Further, in the 1980s the formal sector in both urban and rural (TVEs) absorbed about half of the increment in the labour force and in the first half of the 1990s, formal employment grew faster than the labour force. Since 1995, however, the state and collective sectors continuously shed labour, but absorption by the private sector was less than proportionate to offset both the losses in the former as well as increments to the labour force.[23]

The publication of official data on detailed sectoral employment has been discontinued in both the *China Statistical Yearbooks* as well as *China Labour Yearbooks* since 2003. There are also inconsistencies in the data in these publications in terms of large proportions of unaccounted labour force. For instance, Table 5.2c reproduces disaggregated data on sectoral employment. The sum of manufacturing and construction, which together are statistically represented as the secondary sector (in Table 5.2a), show much lower figures and therefore lower proportions in total labour force. The share of manufacturing in total employment, according to this table fell from 13.3 per cent in 1978 to 11.3 per cent in 2002.[24] Employment in manufacturing and construction together, as a share of total employment however rose from 15.4 per cent in 1978 to touch a high of 19.3 per cent in 1995 but fell to 16.5 per cent in 2002. It is important to note here that reform of the state industrial sector involved laying-off large numbers of its workforce who were either re-employed in their earlier firms with informal contracts at lower wages or became part of an informal private sector that resulted from labour reforms. The category "other' in the table includes this part of the labour force growing from over 5 million in 1978 to 62 million by 2002 (from 1.3 per cent to 8.5 per cent of total employment respectively.[25]

There is however, still a residual portion of employment estimated after deducting the sum of all the sectors (including the category of 'other') from total employment, of the order of 80-100 million persons or 8 per cent to almost 14 per cent of total employment during the period 1990-2002. Since the original tables in the yearbook do not provide any clarifications in this regard and the data in the table does not extend beyond the year 2002 (even though the same table appears in the *China*

22 See Rawski (1999: 5, Table 3).

23 The abrupt fall in labour absorption in 1995 was compounded by the Asian financial crisis a few years later, although the impact on China's growth was limited compared to other emerging economies.

24 The peak shares of manufacturing employment were attained in 1985 and 1995 with figures of 14.9 and 14.4 respectively.

25 Cai Fang et al (2008) in Rawski& Brandt (2008).

Labour Yearbooks and *China Statistical Yearbook* until 2005) it is less reliable for analytical purposes. There are however references in news publications to 'floating' population or labour since the mid 1980s in various high growth urban and rural areas of China. This category is fundamentally migrant labour, whose registered residency is in rural areas (either in the same province or other provinces). There have been various estimates of this floating labour ranging from 70-80 million during the early 1990s to over 210 million in recent years.[26] But without reliable estimates (or official confirmation), it may be incorrect to identify this category as the same as the residual category in Table 5.2c. It is also unlikely that the residual category could be the employment in the Township and Village Enterprises (TVEs) because official TVE employment figures are far lower (18.5 million and 23.36 million in 1990 and 1996 respectively). This is discussed in the next Chapter.

Table 5.2d: China: Urban Employment by Types of Ownership, 1978-2009, (10000 persons & %)

	Total	Urban	SCC	LSJ	Private	Foreign	Self		Residual
	Urban	Share*			Sector	Funded	Employed	Residual	Share**
1978	9514	23.7	9499				15		
1980	10525	24.8	10444				81		
1985	12808	25.7	12314				450	44	0.3
1990	17041	26.3	13895		57	66	614	2409	14.1
1991	17465	26.7	14292		68	165	692	2248	12.9
1992	17861	27.0	14510		98	221	740	2292	12.8
1993	18262	27.3	14313		186	288	930	2545	13.9
1994	18653	27.7	14499		332	406	1225	2191	11.7
1995	19040	28.0	14408		485	513	1560	2074	10.9
1996	19922	28.9	14260		620	540	1709	2793	14.0
1997	20781	29.8	13927		750	581	1919	3604	17.3
1998	21616	30.6	11021	942	973	587	2259	5834	27.0
1999	22412	31.4	10420	1069	1053	612	2414	6844	30.5
2000	23151	32.1	9745	1186	1268	642	2136	8173	35.3
2001	23940	32.8	9086	1368	1527	671	2131	9157	38.2
2002	24780	33.6	8438	1666	1999	758	2269	9651	38.9

26 A recent report on floating population puts the number of migrant workers at 221 million (2010) ("The 2010 Report on the Development of China's Floating Population,") reported in China Daily, 27 June 20100 (accessed on 28th June 2010 from http://www.chinadaily.com.cn/china/2010-06/27/content_10024861.htm). See also Solinger (2001) for an elaborate treatment of the issue of "floating population".

	Total	Urban	SCC	LSJ	Private	Foreign	Self		Residual
	Urban	Share*			Sector	Funded	Employed	Residual	Share**
2003	25639	34.4	8036	1897	2545	863	2377	9921	38.7
2004	26476	35.2	7780	2105	2994	1033	2521	10043	37.9
2005	27331	36.0	7491	2494	3458	1245	2778	9865	36.1
2006	28310	37.1	7382	2706	3954	1407	3012	9848	34.8
2007	29350	38.1	7320	2906	4581	1583	3310	9650	32.9
2008	30210	39.0	7279	3077	5124	1622	3609	9499	31.4
2009	31120	39.9	7202	3427	5544	1699	4245	9003	28.9

SCC-state owned, collectively owned and cooperative units; LSJ–Limited liability, Share holding and Joint ownership
units; * Share in total employment;(%) ** Share in Urban employment (%)
Source: China Statistical Yearbook, 2010

Urban employment data for later years until 2009, are however available in the *China Statistical Yearbook* 2010, but the disaggregation is on the basis of ownership types. Table 5.2c presents the urban employment structure based on various types of ownership forms and here again the sum of all the types do not add up to the total. But the most significant change has been the rapid decline in public employment-state and public owned units–from almost a 100 per cent in 1978 to about 40 per cent by 2009. The corresponding increase has been in the private sector and the foreign funded units together whose share in total urban employment rose from a negligible level to over 23 per cent in 2009. Self-employment as a category was the next important source of urban employment, rising from less than 1 per cent in 1980 to nearly 14 per cent by 2009. Clearly, there is a correspondence between the data in Tables 5.2b and 5.2c (in the residual category). While the 'other' and residual together accounted for over 15 per cent and over 22 per cent of total national employment) in 1990 and 2009 respectively, the urban residual category which was negligible in 1990, increased close to 30 per cent of urban employment by 2009.While the publicly owned units continuously shed labour under reforms, the private sector was unable to compensate adequately for both the released labour as well as the additions to the labour force that accompanied the natural course of population growth. In sum, reforms in the labour market effectively created a large pool of labour that could only be understood as temporary or informal employment or to use the more frequently used term for pre-reform rural China, disguised unemployment (or employment).

5.2c The External Sector

Even though, China began opening up to foreign trade and investment in the early 1980s, it was not until the early 1990s that the major policy initiatives were implemented, which resulted in a rapid integration of China in the global market.

Significant changes in foreign trade and investment in China resulted from sequenced reforms of the foreign trade system-focusing on improvementsin economic incentives via the exchange rate and foreign trade contract responsibility system and implementation of the GATT/WTO commitments since 1995.

Table 5.2e: China: The External Sector, 1982-2009, (US $ Million, %)

	Exports	Imports	FDI*	Share in GDP (%)			
				Exports	Imports	Net Exports	FDI
1982	211.3	168.8	4.3	10.4	8.3	2.1	0.2
1983	207.1	187.2	6.4	9.1	8.2	0.9	0.3
1984	239.1	238.9	12.6	9.3	9.3	0.0	0.5
1985	251.1	382.3	16.6	8.2	12.5	-4.3	0.5
1986	257.6	349.0	18.8	8.6	11.7	-3.1	0.6
1987	347.3	364.0	23.1	12.8	13.5	-0.6	0.9
1988	410.5	463.7	31.9	13.3	15.0	-1.7	1.0
1989	432.2	488.4	33.9	12.6	14.2	-1.6	1.0
1990	515.2	423.5	34.9	14.4	11.9	2.6	1.0
1991	589.2	501.8	43.7	15.5	13.2	2.3	1.2
1992	695.7	643.9	111.6	16.5	15.2	1.2	2.6
1993	756.6	863.1	275.2	17.2	19.6	-2.4	6.2
1994	1025.6	952.7	337.9	18.3	17.0	1.3	6.0
1995	1281.1	1100.6	358.5	17.6	15.1	2.5	4.9
1996	1510.8	1315.4	401.8	17.6	15.4	2.3	4.7
1997	1826.7	1364.5	442.4	19.2	14.3	4.9	4.6
1998	1835.3	1369.2	437.5	18.0	13.4	4.6	4.3
1999	1947.2	1587.3	387.5	18.0	14.7	3.3	3.6
2000	2491.3	2146.6	384.0	20.8	17.9	2.9	3.2
2001	2660.8	2320.6	442.4	20.1	17.5	2.6	3.3
2002	3256.5	2814.8	493.1	22.4	19.4	3.0	3.4
2003	4382.7	3936.2	470.8	26.7	24.0	2.7	2.9
2004	5933.9	5344.1	549.4	30.7	27.7	3.1	2.8
2005	7624.8	6283.0	791.3	33.8	27.8	5.9	3.5
2006	9696.8	7519.4	780.9	35.7	27.7	8.0	2.9
2007	12200.0	9046.2	1384.1	34.9	25.9	9.0	4.0
2008	14346.0	10739.2	1477.9	31.7	23.7	8.0	3.3
2009	12038.0	9542.9	781.9	24.1	19.1	5.0	1.6

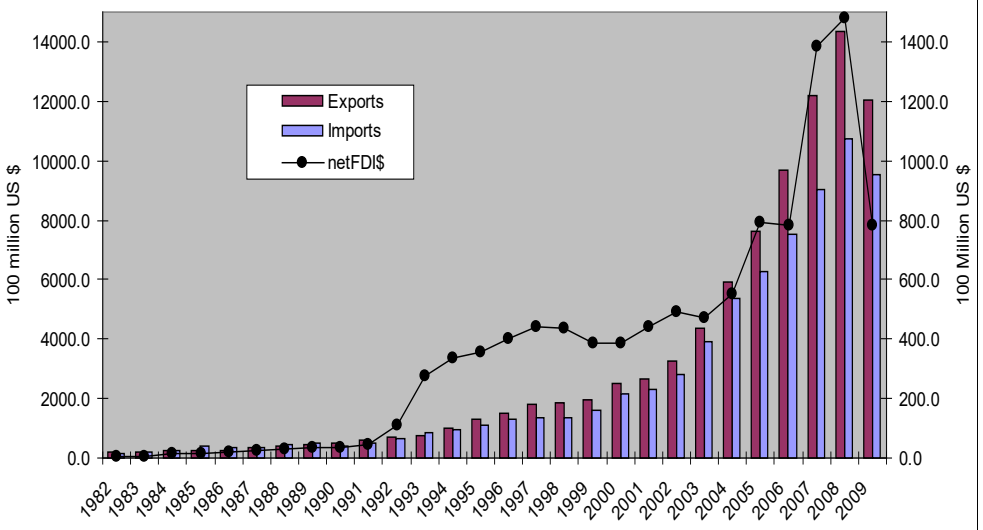
FDI refers to Net FDI as denoted in the WDI database

Source: World Development Indicators Database, the World Bank.

Between 1982 and 1991, exports and imports grew at 12 per cent on average, but this was based on small initial volumes. In the subsequent periods, 1991-97 and 1999-2009 exports grew faster than imports at an annual average of 19.55 and

21.3 per cent respectively (estimated from data in Table 5.2e). As exports grew, the structure of exports changed significantly–China has moved out of agriculture and apparel into electronics and other sophisticated manufactures. However, the bulk of exports are still in the labour-intensive margin, consistent with traditional trade theories (Amiti and Freund, 2007). Imports of goods and services recorded growth rates of 16.7 and almost 20 per cent in the two periods, 1991-97 and 1999-2009.

Chart 5.3 China-The external sector, 1982-2009



Source data: World Development Indicatros Database, World Bank

During the 1980s, annual foreign direct investment was on average only US$ 1.72 billion. In the following 8 years (1991-97) this figure rose to US$ 25.6 billion and to US$ 57.6 billion during 1999-2009, giving an annual average of almost US$ 31 billion for the entire period of 1982-2009. In 2007 and 2008, net FDI doubled over the 2006 level, from US$ 78 billion to US $ 138.4 billion and US$ 147.8 billion, before falling to the earlier level in 2009 (Table 5.2e). Chart 5.3, which maps the trends in FDI and exports and imports, shows rapid growth in foreign trade and significant trade surplus since 1994. Trade surplus was within a range of 1.35 per cent to 3.3 per cent of GDP between 1994 and 2004, rising to almost 6 per cent in 2005 and further to an average of 8.5 per cent in the next three years until 2008. A more detailed picture of foreign trade is provided in Tables 5.2f and 5.2g.

Table 5.2f: China: Structure of Exports (by main commodity groups) 1980-2009, (%)

	Primary Goods				Manufactured Goods				
	Total	Food and Live Animals	Non-edible Raw Materials	Mineral Fuels, Lubricants & Related Materials	Total	Chemicals and Related Products	Industrial, Rubber, Minerals and Metallurgical Products	Machinery and Transport Equipment	Misc. Products
1980	50.3	16.5	9.4	23.6	49.7	6.2	22.1	4.7	15.7
1985	50.6	13.9	9.7	26.1	49.4	5.0	16.4	2.8	12.7
1990	25.6	10.6	5.7	8.4	74.4	6.0	20.3	9.0	20.4
1991	22.5	10.0	4.8	6.6	77.5	5.3	20.1	9.9	23.1
1992	20.0	9.8	3.7	5.5	80.0	5.1	19.0	15.6	40.3
1993	18.2	9.2	3.3	4.5	81.8	5.0	17.9	16.7	42.3
1994	16.3	8.3	3.4	3.4	83.7	5.2	19.2	18.1	41.3
1995	14.4	6.7	2.9	3.6	85.6	6.1	21.7	21.1	36.7
1996	14.5	6.8	2.7	3.9	85.5	5.9	18.9	23.4	37.4
1997	13.1	6.1	2.3	3.8	86.9	5.6	18.8	23.9	38.6
1998	11.2	5.7	1.9	2.8	88.8	5.6	17.7	27.3	38.2
1999	10.2	5.4	2.0	2.4	89.8	5.3	17.1	30.2	37.2
2000	10.2	4.9	1.8	3.2	89.8	4.9	17.1	33.1	34.6
2001	9.9	4.8	1.6	3.2	90.1	5.0	16.5	35.7	32.7
2002	8.8	4.5	1.4	2.6	91.2	4.7	16.3	39.0	31.1
2003	7.9	4.0	1.1	2.5	92.1	4.5	15.7	42.8	28.8
2004	6.8	3.2	1.0	2.4	93.2	4.4	17.0	45.2	26.4
2005	6.4	3.0	1.0	2.3	93.6	4.7	16.9	46.2	25.5
2006	5.5	2.7	0.8	1.8	94.5	4.6	18.0	47.1	24.6
2007	5.1	2.5	0.7	1.6	94.9	5.0	18.1	47.4	24.4
2008	5.4	2.3	0.8	2.2	94.6	5.5	18.3	47.1	23.5
2009	5.3	2.7	0.7	1.7	94.7	5.2	15.4	49.1	24.9

Source Data: China statistical Yearbook, 2010

Table 5.2g: China: Structure of Imports (by main commodity groups), 1980-2009 (%)

	Primary Goods				Manufactured Goods				
	Total	Food and Live Animals	Non-edible Raw Materials	Mineral Fuels, Lubricants & Related Materials	Total	Chemicals and Related Products	Industrial, Rubber Products, Minerals & Metallurgical Products	Machinery and Transport Equipment	Misc. Products
1980	34.8	14.6	17.8	1.0	65.2	14.5	20.8	25.6	2.7
1985	12.5	3.7	7.7	0.4	87.5	10.6	28.2	38.4	4.5
1990	18.5	6.3	7.7	2.4	81.5	12.5	16.7	31.6	3.9
1991	17.0	4.4	7.8	3.3	83.0	14.5	16.4	30.7	3.8
1992	16.4	3.9	7.2	4.4	83.6	13.8	23.9	38.9	6.9
1993	13.7	2.1	5.2	5.6	86.3	9.3	27.4	43.3	6.2
1994	14.3	2.7	6.4	3.5	85.7	10.5	24.3	44.5	5.9
1995	18.5	4.6	7.7	3.9	81.5	13.1	21.8	39.9	6.3

	Primary Goods				Manufactured Goods				
	Total	**Food and Live Animals**	**Non-edible Raw Materials**	**Mineral Fuels, Lubricants & Related Materials**	**Total**	**Chemicals and Related Products**	**Industrial, Rubber Products, Minerals & Metallurgical Products**	**Machinery and Transport Equipment**	**Misc. Products**
1996	18.3	4.1	7.7	5.0	81.7	13.0	22.6	39.4	6.1
1997	20.1	3.0	8.4	7.2	79.9	13.6	22.6	37.1	6.0
1998	16.4	2.7	7.6	4.8	83.6	14.4	22.2	40.5	6.0
1999	16.2	2.2	7.7	5.4	83.8	14.5	20.7	41.9	5.9
2000	20.8	2.1	8.9	9.2	79.2	13.4	18.6	40.8	5.7
2001	18.8	2.0	9.1	7.2	81.2	13.2	17.2	43.9	6.2
2002	16.7	1.8	7.7	6.5	83.3	13.2	16.4	46.4	6.7
2003	17.6	1.4	8.3	7.1	82.4	11.9	15.5	46.7	8.0
2004	20.9	1.6	9.9	8.6	79.1	11.7	13.2	45.0	8.9
2005	22.4	1.4	10.6	9.7	77.6	11.8	12.3	44.0	9.2
2006	23.6	1.3	10.5	11.2	76.4	11.0	11.0	45.1	9.0
2007	25.4	1.2	12.3	11.0	74.6	11.3	10.8	43.1	9.2
2008	32.0	1.2	14.7	14.9	68.0	10.5	9.5	39.0	8.6
2009	28.8	1.5	14.1	12.3	71.2	11.1	10.7	40.5	8.5

Source Data: China statistical Yearbook, 2010

Dean, Fung and Wang (2007) have shown, that between 1995 to 2005, in current dollars, China's exports plus imports grew at a rate of 311 percent. China's policy regime favoring processing trade, provided incentives for import of intermediate goods, which were then transformed into finished goods for export. In 2005, processing trade accounted for 42 percent of China's imports from the world, and 55 percent of China's exports to the world. The authors find on the whole that about 35 percent of the value of China's exports to the world is attributable to imported inputs. This vertical specialization exceeds 50 per cent in some sectors, and is growing over time. Much of this trade in carried out by foreign firms.

Cui and Syed (2007) however argue that China is moving away from traditional 'assembly' operations and its exports have started to rely more on domestically sourced components. In turn, China's imports and exports have begun to delink, with increased domestic sourcing contributing to the recent increase in its trade balance. China is therefore moving up the value chain and both its imports and exports have become more sophisticated than in the past. Schoott (2006) has noted, based on empirical research, that from the standpoint of product penetration in OECD markets, China is far ahead of its peers from other Asian and Latin American countries.

As a result of these shifts, China may be becoming more exposed to fluctuations in the global economy, and changes in its exchange rate could have a bigger impact on the trade balance and therefore the domestic economy.

5.3 STRUCTURAL MACROECONOMIC IMBALANCES IN POST-REFORM CHINA

5.3A Savings, Investment and CONSUMPTION

The broad trends in savings and investment for the period 1978-2009, presented in tables 5.3a and 5.3b reveal a steady growth accompanied by cyclical expansion in consumption.

The share of household consumption and its growth rates fell significantly since the early 1990s. The share of household consumption in GDP fell from an average of 50 per cent during 1978-89, to 44 per cent during 1995-99 and further to 35.6 per cent during 2005-09.

Table 5.3a: China: Savings, Capital Formation and Consumption, 1978-2009 (100 Million Constant Yuan)

	GDS	GFCF	HHC	Govt.con.
1978-79	6006	4005	7398	2155
1980-84	7741	5255	10257	2920
1985-89	11789	9252	17333	4682
1990-94	17891	14208	24137	7739
1995-99	30673	26258	37254	11492
2000-04	48805	43103	52057	18102
2005-09	97460	78786	75601	28050
Indices				
	GDS	**GFCF**	**HHC**	**Govt.con.**
1978-79	100.0	100.0	100.0	100.0
1980-84	128.9	131.2	138.7	135.5
1985-89	196.3	231.0	234.3	217.3
1990-94	297.9	354.8	326.3	359.2
1995-99	510.7	655.7	503.6	533.4
2000-04	812.7	1076.3	703.7	840.1
2005-09	1622.8	1967.4	1022.0	1301.9
Average Shares in GDP (%)				
	GDS	**GFCF**	**HHC**	**Govt.con.**
1978-79	36.4	28.9	49.3	14.2
1980-84	35.0	28.7	49.9	15.1
1985-89	35.9	29.8	50.1	14.0
1990-94	40.5	31.8	44.3	15.2
1995-99	41.9	33.8	43.8	14.4
2000-04	41.1	37.0	43.7	15.2
2005-09	50.5	41.3	35.8	13.6

Source: Table 5.1d

Savings and gross fixed capital formation (GFCF) as a share of GDP, correspondingly expanded continuously over the entire period. From 36.4 per cent and 29 per cent respectively during 1978-79, these shares rose to 50.5 per cent and 41.3 per cent during 2005-09. The expansion between the periods 2000-04 and 2005-09 was almost 100 per cent in both savings and GFCF.

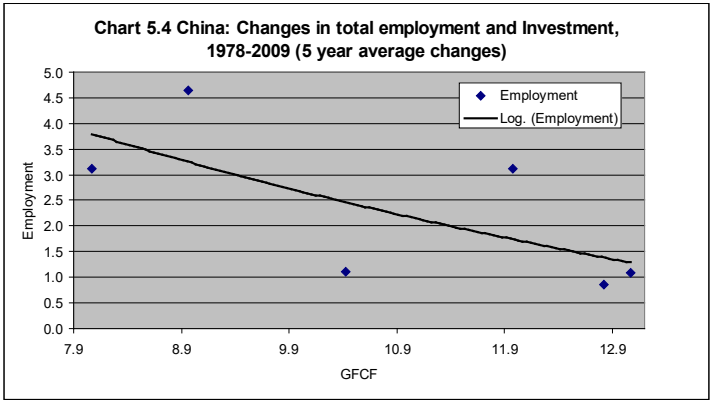
The relationship between the growth of investment (at high rates as also high share in GDP) and that of employment, has been weak throughout the period. As evident in Chart 5.4, there is a negative relationship between changes in GFCF and in the total employment over the period 1978-2009. In the agricultural sector too, the relationship between total government spending and employment is similar (Chart 5.5). This relationship is reflected in an increasing output per person employed in all the broad sectors.

Table 5.3b: China: Growth of Savings, Capital Formation and Consumption, 1978-2009

5 Year Growth Rates (%)				
	GDS	**GFCF**	**HHC**	**Govt.con.**
1978/79-1980-84	28.9	31.2	38.7	35.5
1980/84-1985/89	52.3	76.1	69.0	60.3
1990/94-1995/99	51.8	53.6	39.3	65.3
1990/94-1995/99	71.4	84.8	54.3	48.5
1995/99-2000/4	59.1	64.2	39.7	57.5
2000/04-2005/09	99.7	82.8	45.2	55.0
Compound Growth Rates, % p.a				
	GDS	**GFCF**	**HHC**	**Govt.con.**
1978/79-1980-84	7.5	8.1	9.8	9.1
1980/84-1985/89	8.8	12.0	11.1	9.9
1990/94-1995/99	8.7	9.0	6.8	10.6
1990/94-1995/99	11.4	13.1	9.1	8.2
1995/99-2000/4	9.7	10.4	6.9	9.5
2000/04-2005/09	14.8	12.8	7.7	9.2

Source: Table 5.1d

As Table 5.3c reveals, between 1978-79 and 2005-09, GDP per person employed and manufacturing value added per employed, grew by over 7 times. The corresponding figures for the primary and tertiary sectors were roughly 3 and 4 times respectively. The relationship between the primary and the tertiary sector has been such that the transfer of labour from the former to the latter, has led to a convergence in the average product per employee in both the sectors.



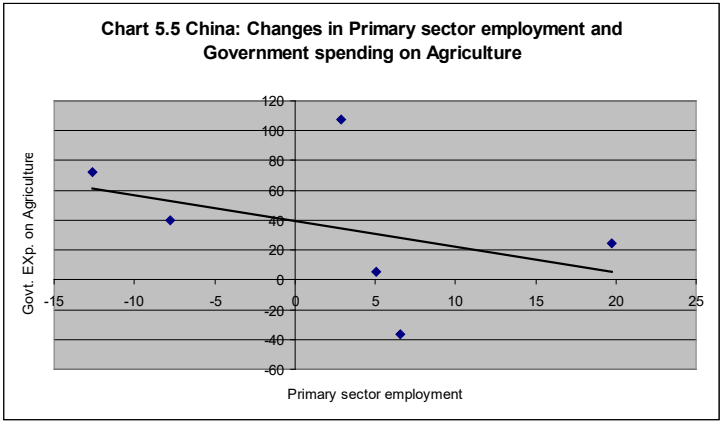


Table 5.3c: Average Productivity Changes, National and by Sector (Yuan)

	National*	Primary	Secondary	Tertiary
1978-79	3338	1952	6190	8358
1980-84	3963	2230	6875	9355
1985-89	5771	2819	9068	12756
1990-94	7067	2906	12494	13497
1995-99	11248	3882	21577	16237
2000-04	16115	4392	34196	22269
2005-09	26097	6309	48439	32960
		Indices		
1978-79	100.0	100.0	100.0	100.0
1980-84	118.7	114.3	111.1	111.9

1985-89	172.9	144.4	146.5	152.6
1990-94	211.7	148.9	201.8	161.5
1995-99	337.0	198.8	348.6	194.3
2000-04	482.8	225.0	552.4	266.4
2005-09	781.9	323.2	782.6	394.3
	5year growth rates			
	National*	Primary	Secondary	Tertiary
1978/79-1980-84	18.7	14.3	11.1	11.9
1980/84-1985/89	45.6	26.4	31.9	36.4
1990/94-1995/99	22.5	3.1	37.8	5.8
1990/94-1995/99	59.2	33.6	72.7	20.3
1995/99-2000/04	43.3	13.1	58.5	37.1
2000/04-2005/09	61.9	43.6	41.7	48.0

*GDP Divided by total employment. Similarly for other sectors: Sectoral GDP per employed.

Source: Tables 5.1 and 5.2a

5.3B Economic Growth and Inequality

The expansion of the Chinese economy at an average annual growth rate of 9.5 per cent over more than three decades has been unprecedented in any other part of the world. The performance is all the more striking given the size in terms of population and regional diversity in terms of ecology, resource endowments and geographical challenges, besides other characteristics that define China. While it is difficult to attribute the growth experience to one central dynamic, three inter-related sources of growth could be identified. By 1978, the capital goods sector was fairly well developed, with the over-emphasis throughout the pre-reform period on heavy industry. In agriculture too, irrigation and mechanization had advanced considerably, with the only deficit being the availability of adequate supplies of chemical fertilizers. In combination with the third sufficient condition for technical transformation, namely higher yielding seed varieties, use of fertilisers in agriculture had already been developed by the mid-1960s and spread widely by the late 1970s. Besides these China was adequately advanced in terms of human capital, owing to large investments in education and health. These three, in addition to a highly organized administrative institutional network up to the local level of villages, provided favourable initial conditions. Bramall (2000) points out that at least until the mid-nineties, there was strong evidence for productivity growth increases in manufacturing as well as in agriculture[27] and the cumulative interaction of this

27 Bramall (2000) notes that trends in total factor productivity are impossible to measures with any degree of precision in both agriculture and industry, and estimates suffer from serious analytical and empirical problems. Nevertheless, available data points to significant increases, post-1978. Bramall also critically examines growth theories and locates the inadequacies in their formulations and inappropriateness in their utility in explaining Chinese post-reform growth.

together with faster factor accumulation as well as favourable initial conditions, produced the quantum of growth observed in China.

While growth was indisputably high, it is also possible to identify some elements of the transformation, which also reveal the weaker links in the evolving economic structure. Three such elements are considered in the discussion here, as part of an evaluation of post reform macroeconomic transformation. The first concerns the structure of domestic demand that continued as a legacy from the previous era, but one that had greater relevance than in the recent past. The second element also concerns demand but one that emerged and evolved intrinsically with the closer integration of the Chinese with the international economy. The third and final aspect relates to the break from the legacy as regards the basic objective of an equitable distribution of income and wealth.

Table 5.3d: China: Consumption Expenditure Per Capita of Households by Residence, 1978-2009

	Comparable 1978 Prices, Yuan				
	Urban	**Index**	**Rural**	**Index**	**Ratio***
1978	343.4	100.0	133.6	100.0	2.6
1980	435.9	126.9	171.2	128.1	2.5
1985	552.9	161.0	307.7	230.3	1.8
1990	731.6	213.0	364.3	272.7	2.0
1995	1066.6	310.6	469.1	351.1	2.3
1996	1111.0	323.5	529.3	396.2	2.1
1997	1149.9	334.9	559.4	418.7	2.1
1998	1220.0	355.3	583.1	436.4	2.1
1999	1343.7	391.3	613.7	459.3	2.2
2000	1452.2	422.9	620.8	464.6	2.3
2001	1576.3	459.0	643.5	481.7	2.4
2002	1776.1	517.2	676.1	506.1	2.6
2003	1941.7	565.4	704.6	527.4	2.8
2004	2088.1	608.1	745.6	558.1	2.8
2005	2266.3	660.0	799.1	598.1	2.8
2006	2477.6	721.5	858.0	642.2	2.9
2007	2788.7	812.1	933.3	698.6	3.0
2008	3031.5	882.8	996.8	746.1	3.0
2009	3297.1	960.1	1090.8	816.5	3.0

* urban/rural. *Source: China Statistical Yearbook*, various years

Per capital household consumption grew at a trend rate of 8 per cent during 1978-90, compared over 9 per cent in the case of GFCF, but fell to 6.7 per cent in the remaining period until 2009. The corresponding figure for GFCF was 11.2 per cent. Attempts to explain the declining share of household consumption in GDP have focused on household savings behavior–high and rising saving rates–owing to income

growth as well as to rising uncertainties and risks with regard to health, education, pensions etc, that emerged with the withdrawal of the state from provision of welfare and social services. However, Aziz and Li (2007) show that declines in consumption arose not out of increased savings (as enterprise savings were more dominant in total savings) but due to slower growth rates of incomes and a decline in wage share in total income.[28]

The discussion of the external sector in the previous section clearly shows the increasing role of trade in driving demand and therefore growth. The combination of declining consumption and dependence on external demand for growth, has increased the vulnerability of China's economic growth and its sustenance. Though the Chinese government has in recent years emphasized the need to correct the structural imbalance between investment and consumption, this cannot come about without increase in personal incomes that accrue to those groups that have the potential to augment demand.

Table T5.3e: China: Disposable Income Per Capita of Households by Residence, 198-2009

	Comparable 1978 Prices, Yuan			
	National	**Rural**	**Urban**	**Ratio**
1978	184	138	405	2.9
1980	214	159	446	2.8
1985	341	270	572	2.1
1990	422	297	773	2.6
1995	635	390	1228	3.1
1996	695	447	1270	2.8
1997	726	461	1298	2.8
1998	769	467	1374	2.9
1999	832	490	1470	3.0
2000	903	512	1584	3.1
2001	959	535	1646	3.1
2002	1026	563	1726	3.1
2003	1098	565	1847	3.3
2004	1187	589	1975	3.4
2005	1279	633	2083	3.3
2006	1402	686	2251	3.3
2007	1552	742	2470	3.3
2008	1687	795	2660	3.3
2009	1843	851	2884	3.4

Source: Table 5.3b

28 Wage income in GNP fell from around 69 per cent in 1980 to around 56 per cent in 2005, see Aziz and Li (2007)

This brings forth the issues concerning income distribution and its evolution in the reform period. Table 5.3d and T5.3e present data on disposable income and consumption expenditure respectively for 1978-2009 for rural and urban households,. The disparity between the rural and urban incomes as well as consumption expenditures widened faster since the early 1990s. The growth of rural per capita household disposable income during 1991-2009 was 5.7 per cent p.a., while the corresponding growth in urban income was two percentage points higher at 7.7 per cent. Rural urban income differential is only one of the manifestations of worsening income distribution. Personal income distribution has also displayed a similar movement reflected in increasing Gini coefficients-0.33 in 1980, 0.40 in 1994 and 2003 and 0.45 in 2005.[29]

Table 5.3c: China: Per Capita Net Income of Rural Households by Region, National =100

	1990	1995	2000	2005	2007-9*
Gansu	62.8	55.8	63.4	60.8	57.1
Guizhou	63.4	68.9	61.0	57.7	58.1
Tibet	94.7	76.1	59.1	63.8	67.5
Shaanxi	77.3	61.0	64.1	63.1	65.5
Yunnan	78.8	64.1	65.6	62.7	64.7
Qinghai	81.6	65.3	66.1	66.1	64.7
Ningxia	84.2	63.3	76.5	77.1	77.6
Xinjiang	99.6	72.0	71.8	76.3	75.3
Guangxi	93.2	91.7	82.7	76.6	77.5
Shanxi	87.9	76.6	84.6	88.8	85.7
Sichuan	81.3	73.4	84.5	86.1	86.3
Anhui	78.6	82.6	85.9	81.1	87.2
Henan	76.8	78.1	88.1	88.2	93.3
Hunan	96.8	90.3	97.5	95.8	94.8
Inner Mongolia	88.5	76.6	90.4	91.8	96.4
Hubei	97.7	95.8	100.7	95.2	97.4
Jiangxi	97.6	97.4	94.8	96.1	98.3
Hebei	90.6	105.8	110.0	107.0	101.5
National	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Liaoning	121.8	111.3	104.5	113.4	116.0
Jilin	117.1	102.0	89.8	100.3	102.3
Heilongjiang	110.7	111.9	95.3	99.0	100.9
Jiangsu	139.7	155.7	159.5	162.1	156.1
Zhejiang	160.1	188.0	188.8	204.6	196.1
Fujian	111.4	129.8	143.4	136.7	130.6
Shandong	99.1	108.7	118.0	120.8	119.2
Guangdong	152.0	171.1	162.2	144.1	134.8

*Three year average. *Source: China Statistical Yearbook*, various years

29 This data is compiled from the *China Statistical Yearbooks*. See also Chang (2002) and *People's Daily*, English edition, September 21, 2005, 'Party school journal warns against China's widening income gap'.

Table 5.3d: China: Growth Rates of Provincial Domestic Product, 1980-2004

	1980-2004	1985-2004	1985-95	1996-2004
Gansu	4.64	4.62	1.75	7.69
Guizhou	4.98	4.35	3.42	8.04
Ningxia	5.18	5.06	3.06	8.25
Qinghai	5.47	5.41	3.29	10.19
HeiLJiang	5.91	6.73	4.67	8.86
InnMong	5.92	5.51	2.24	9.95
Shaanxi	5.99	5.67	3.88	10.12
Liaoning	6.02	5.96	4.60	8.64
Hunan	6.10	6.48	4.39	8.04
Sichuan	6.30	6.25	5.46	6.95
Shanxi	6.33	6.72	3.94	9.67
Jilin	6.42	6.39	4.35	8.94
Anhui	6.62	6.20	3.44	6.95
Jiangxi	6.63	7.01	5.15	8.49
Hubei	6.66	6.58	4.25	8.06
Yunnan	6.79	6.24	7.27	5.95
Guangxi	6.86	7.28	7.95	7.78
China	**6.91**	**6.72**	**6.37**	**7.11**
Henan	8.42	8.59	6.79	9.79
Jiangsu	8.50	8.60	7.22	10.18
Hebei	8.74	9.13	7.84	9.86
Shandong	8.82	8.82	7.88	9.90
Guangdong	8.98	8.84	9.49	8.82
Zhejiang	9.34	9.38	7.91	10.68
Fujian	10.44	10.74	10.93	8.27

Growth rate estimated by least squares (current price data adjusted by relevant consumer price indices)

Source data: Provincial Statistical Yearbook, various years

Regional disparities in terms of agricultural and industrial production and therefore economic development, existed in pre-reform China owing to natural endowments as well initial conditions. The urban rural divide in terms of incomes was however not of the order found in other developing countries during that period. This was owing to the policy emphasis on reducing differentials between the rural and urban and that of incomes of farming population and industrial labour. In the post-reform period however, disparities across provinces increased monotonically. More significantly, inter-provincial rural differentials widened considerably. Table 5.3c and 5.3d present provincial data on rural per capita income and their growth rates for the period 1980-2004.

The ratio of the lowest provincial average rural per capita net income to the highest in 1981-84, was roughly half, but by 2001-04, the ratio had fallen to a third.

Relatively richer provinces at the start of reforms grew faster over the period, thereby widening the gap with the poorer ones despite growth rates of per capita net income being higher during 1996-2004 relative to 1985-96 (Natrajan 2006).

The combination of the three elements discussed above, points to a need for long-term and direct means to address each of the problems. High growth rates of the economy with these embodied elements may only exacerbate the problems that resulted from it. Considering the cyclical pattern of radical policy shifts in China since 1949, a new phase of reform of the 'reformed socialist market economy' appears to be possible in the near future. The next chapter takes up for a detailed discussion, developments in rural China following the adoption of reforms, in order to examine if there are additional reasons for such a possibility.

6. Agrarian Change and Rural Transformation Under Reform

6.0 INTRODUCTION

The performance of agriculture following reforms, in particular the ability of that sector to feed a growing population given an almost fixed (in fact shrinking) cultivable land, was impressive in the first phase until 1984. The devolution of production decisions to the level of the household, combined with large increases in procurement prices, brought about a sudden 'explosion' of production in all the agricultural sub-sectors in the initial phase of reforms. The rates of growth were higher in animal husbandry and fisheries (as also forestry) than in grain production. While the rapid growth in non-grain food production came about with the expansion in the number and size of local markets, that of grain production resulted from large increases in procurement prices. Between 1979 and 1981, the total additional income to the farming sector from procurement price increases was estimated at Yuan 46.3 b, equal to 10.5 per cent of total gross value of agricultural output (GVAO) for those years.[1] Over the period 1978 to 1994, agriculture grew at an annual rate of 7.2 per cent.[2] Per capita grain production was one-fifth higher by 1992 at 380 kg. compared to 318.7 kg. in 1978.[3] Rural real incomes during 1978-91 grew at an average rate of 7.5 per cent p.a. with the major spurt at 13.4 per cent concentrated in the period 1978-84.[4]

However, the pace of growth of the first phase did not continue after 1985. In particular grain production growth slowed down while animal produce (and fisheries) continued on an expansionary path for the rest of the period. Animal husbandry and fishery sectors grew the fastest at over 8 per cent and 10.5 per cent annually between 1978 and 2009.

1 This estimate is based on current values. See Kueh& Ash (1993: 21)

2 During the initial phase of reform (1978-84) GVAO rose by 40 per cent. The performance of agriculture in the six years from 1978-84 was repeatedly quoted by several commentators to demonstrate the 'liberating' power of the market - As Field (1988: 123: puts it " Gross value increased as much in the six years from 1978 to 1984 as it did in the twenty years from 1957 to 1978".

3 These figures are in terms of the definition of grain used in China that includes soybeans and tubers in dry weight equivalent. A more detailed exercise on the availability of food and nutrition in post-reform China is taken up in a later chapter.

4 The growth of real expenditure in current terms, of rural residents was also impressive - 8.4 per cent p.a. in 1978-84 falling to 3.0 per cent p.a. in the next six years and 6.5 per cent p.a. for the entire period 1978-91. Improvements in housing in terms of increases in area, was at a rate of 6.6 per cent p.a. during 1978-91 (These data are from sample surveys conducted by the State Statistical Bureau).

Table 6.1a: China: Growth Rates in the Agricultural Sector, 1978-2009

	1978-84	1985-92	1993-2009	1985-2009	1978-2009
Agriculture	7.2	4.7	5.4	5.9	5.96
Farming	6.9	3.7	4.3	4.3	4.51
Forestry	8.4	2.4	4.4	4.6	4.81
Animal Husbandry	8.6	7.2	6.9	8.0	8.37
Fishery	7.6	11.1	7.3	9.7	10.65

Source: Table A6.1

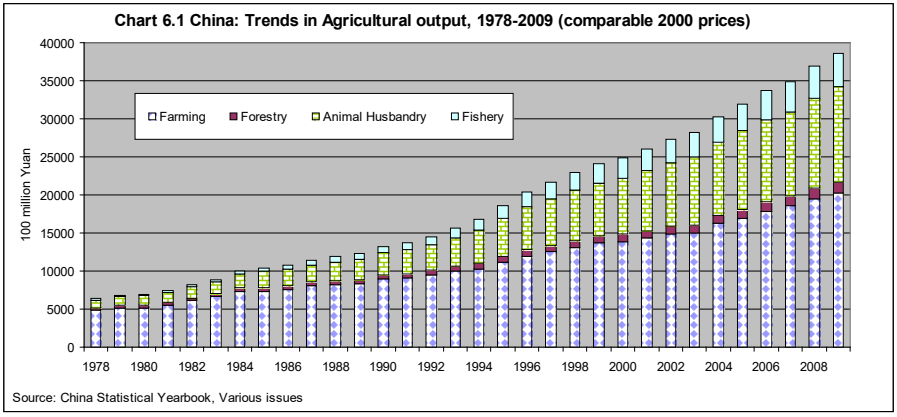


Table 6.1b: China: Gross Output Value in Agriculture by Sub-sector, 1978-2009

Comparable 2000 Prices, Five Year Averages (except 1978-79), 100 Million Yuan					
	Total	**Farming**	**Forestry**	**Animal Husbandry**	**Fishery**
1978-79	6599.5	4994.0	299.5	1094.3	231.4
1980-84	8267.9	6139.8	399.2	1481.9	293.1
1985-89	11179.3	7887.0	513.2	2351.7	603.2
1990-94	14576.1	9566.4	626.0	3514.3	1069.2
1995-99	21519.7	12472.7	832.5	6095.4	2156.8
2000-04	27369.9	14894.5	1002.3	8418.7	3002.3
2005-09	35467.7	18620.8	1279.5	11329.4	3981.5
Indices					
	Total	**Farming**	**Forestry**	**Animal Husbandry**	**Fishery**
1978-79	100.0	100.0	100.0	100.0	100.0
1980-84	125.3	122.9	133.3	135.4	126.6
1985-89	169.4	157.9	171.4	214.9	260.6
1990-94	220.9	191.6	209.0	321.1	462.0
1995-99	326.1	249.8	278.0	557.0	931.9
2000-04	414.7	298.2	334.7	769.3	1297.3
2005-09	537.4	372.9	427.3	1035.3	1720.3

5 Year Average Change					
	Total	**Farming**	**Forestry**	**Animal Husbandry**	**Fishery**
1978/79-1980-84	25.3	22.9	33.3	35.4	26.6
1980/84-1985/89	35.2	28.5	28.6	58.7	105.8
1990/94-1995/99	30.4	21.3	22.0	49.4	77.2
1990/94-1995/99	47.6	30.4	33.0	73.4	101.7
1995/99-2000/4	27.2	19.4	20.4	38.1	39.2
2000/04-2005/09	29.6	25.0	27.7	34.6	32.6
Share in Total Agriculture (%)					
		Farming	**Forestry**	**Animal Husbandry**	**Fishery**
1978-79		0.757	0.045	0.166	0.035
1980-84		0.743	0.048	0.179	0.035
1985-89		0.706	0.046	0.210	0.054
1990-94		0.659	0.043	0.240	0.073
1995-99		0.581	0.039	0.283	0.100
2000-04		0.545	0.037	0.307	0.110
2005-09		0.525	0.036	0.319	0.112

Source: Table A6.1

(See Chart 6.1 and Table 6.1a). These differential growth rates are reflected in their shares in total gross output value of the primary sector – farming declined by 24 percentage points (from 76 per cent in 1978) whereas animal husbandry and fisheries together rose from 20 per cent in 1978 to over 43 per cent by 2009 (Table 6.1b)

The effect of weather-induced factors on agricultural production that seriously disrupted the general trend prior to the mid-1960s was already moderated by the time reforms were initiated. But extreme weather as an important determinant of agricultural production in individual years continued to remain significant. Further, as in the earlier period, the effect of frequent policy shifts on economic performance gave rise to distinctly discernible phases (or cycles) in the latter period. In fact, policy shifts became more frequent and intense in post-reform China, due to rapid diversification in all sectors and a corresponding loss of control by the government over the economy owing to continued decentralization of authority, as well as the withdrawal of the state from many spheres of production and distribution. These influences altered or aggravated some of the basic conditions in agriculture.

For instance, the already land-starved economy witnessed large reductions in arable area after 1978 as a direct consequence of rural industrialization and infrastructure development. The impact of such reductions assumes as much significance for food security as the shift in area away from food crops towards non-food high value crops that the reforms effectively promoted. In the following sections, changes in the areas of land farmed, in intermediate and capital inputs and the composition of agricultural produce are taken up.

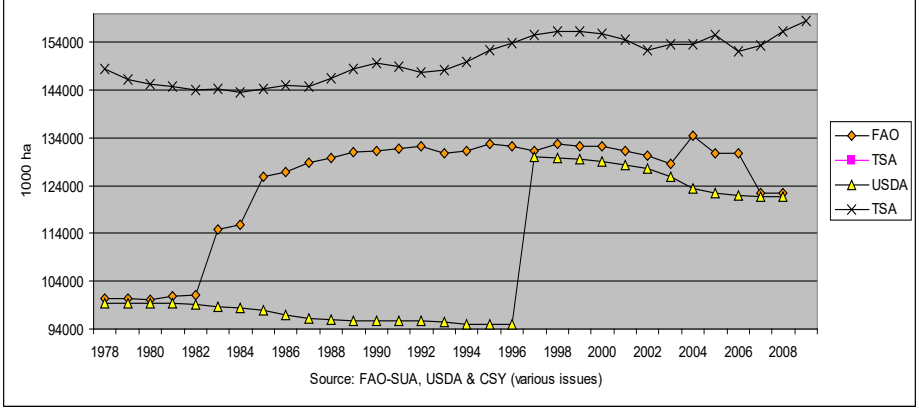
6.1 CHANGES IN LAND USE PATTERNS (1978-2009)

Before considering the trends in total area sown and the areas sown under different crops, it is appropriate to note the extent of changes in the actual area cultivated (or the area under permanent crops). A matter of serious concern for the Chinese has been the decline in the arable/cultivated area since the early 1970s. Between 1970 and 1978, the total decline in available arable area was of the order of almost 1.7 million hectares - a rate of decline of 0.2 per cent p.a. However, this was offset by the increase in the intensity of cultivation or multiple cropping, which increased by 27.7 per cent during the period - increasing at a rate of 0.5 per cent p.a.

As shown in Chart 6.2, the estimates by the FAO and the USDA (which is a compilation of annually published official data), of total cultivated area (or arable area) vary considerably between 1983 and 1996. The FAO series seems to have been revised upwards in 1983 (by 13.7 million ha) and the USDA series in 1997 (by over 35 million ha) after which the two series converge. These upward revisions account for a significant share of total additions to cultivated area, which for the period 1978-2008 was 22.2 million ha and 15.9 million ha respectively, in the two series.

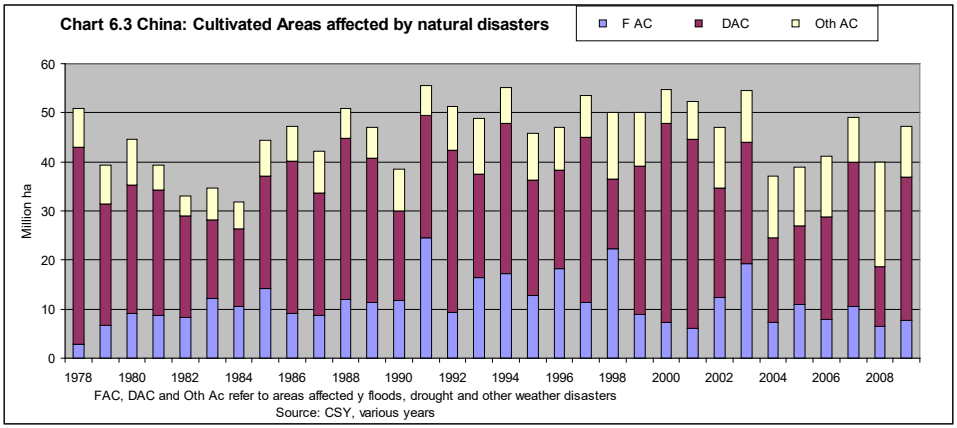
Reductions to cultivated area may result from a variety of factors that include weather or diversion away from farming, either for household use or public infrastructure or rural industry. The additions to cultivated areas may either result from bringing into cultivation of fallow land in a particular year, or reclamation of new land or recording previously undeclared land.

Chart 6.2 China: Cultivated and total Sown Areas, 1978-2009,



Source: FAO-SUA, USDA & CSY (various issues)

Table 6.1c is a compilation of data for 1978-2008 on cultivated areas and areas affected by weather – both flood and drought. Chart 6.3 displays the same data but includes areas affected by other weather disturbances. It can be seen that droughts have throughout been dominant – except in 1991 and 1998 when floods were more severe and in 2008 when other natural disasters (such as earthquakes and typhoons) affected a greater proportion of farmland. There is however, no clear trend or cyclical pattern that is evident for the period.[5]



Besides the loss of arable area due to weather-induced factors, additional losses emerged due to diversion of cultivable land for non-agricultural purposes. Cumulative losses due to diversion of land for capital construction, village collective construction and individual peasant construction over the period 1984-1995, amounted to over 2.56 million ha accounting for 58 per cent of the cumulative reduction in cultivated area. More serious however, was the quantum of land diverted away from farming for purposes other than the three mentioned above. The total diversion was of the order of over 10 million ha during 1984-95, which was 226 per cent of the net reduction in total cultivated area during the same period.[6] Wu and Wang (2000) observed that official estimates of arable land might be understated by up to 40 per cent due partly to unregistered land. Satellite imagery projections conducted between

5 The correlation coefficients between total areas affected on the one hand and total sown areas and cultivated areas on the other, are 0.53 and 0.46 respectively. Clearly, the predominance of drought may explain the weak correlation with sown area, as multiple sown areas are possible only where drought is absent.

6 These figures are from *China Statistical Yearbook 1996*.

1980 and 1996, place estimates at between 131.1 and 139.6 million ha.[7] This has serious implications for analytical exercises concerning estimates of productivity. Besides, the permanent feature in Chinese agriculture relating to weather induced losses– both financial and direct impact on output –and the annual costs incurred to mitigate the same, requires a more complex exercise to evaluate productivity changes over time.[8]

Table 6.1c: Arable Land and Areas Affected by Weather, 1000 ha

		Areas Affected by Weather				
	TSA	**Total**	**Floods**	**Drought**	**Irrigated Area**	**PIA***
1978-79	147428	21800	920	17970	44965	24895
1980-84	144351	17702	4416	10300	44657	25255
1985-89	145789	21192	6032	12034	44299	25126
1990-94	148891	23822	7840	11908	47492	28158
1995-99	154946	26074	9770	11754	50391	33142
2000-04	153973	30547	6554	18963	53919	36036
2005-09*	154342	22986	4844	11215	56442	37413
Indices						
		Areas Affected by Weather				
	TSA	**Total**	**Floods**	**Drought**	**Irrigated Area**	**PIA***
1978-79	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	97.9	81.2	480.0	57.3	99.3	101.4
1985-89	98.9	97.2	655.7	67.0	98.5	100.9
1990-94	101.0	109.3	852.2	66.3	105.6	113.1
1995-99	105.1	119.6	1062.0	65.4	112.1	133.1
2000-04	104.4	140.1	712.3	105.5	119.9	144.8
2005-09*	104.7	105.4	526.5	62.4	125.5	150.3
5-year change (%)						
		Areas Affected by Weather				
	TSA	**Total**	**Floods**	**Drought**	**Irrigated Area**	PIA*
1978/79-1980-84	-2.1	-18.8	380.0	-42.7	-0.7	1.4
1980/84-1985/89	1.0	19.7	36.6	16.8	-0.8	-0.5
1990/94-1995/99	2.1	12.4	30.0	-1.0	7.2	12.1
1990/94-1995/99	4.1	9.5	24.6	-1.3	6.1	17.7
1995/99-2000/4	-0.6	17.2	-32.9	61.3	7.0	8.7
2000/04-2005/09	0.2	-24.8	-26.1	-40.9	4.7	3.8

7 Smil (1999: 418) Table 1.

8 Further, the effect on agricultural output and its composition under the 'reformed' institutional structure flows not only from prices (which are determined not by the market alone) but also from government policy (on the supply side) and the evolving distribution of income (on the demand side).

Share in Cultivated Area (%)						
		Total	**Floods**	**Drought**	**Irrigated Area (IA)**	**% PIA to Total IA***
1978-79		21.9	0.9	18.1	45.2	55.4
1980-84		17.8	4.5	10.4	45.0	56.6
1985-89		21.9	6.2	12.4	45.7	56.7
1990-94		24.9	8.2	12.5	49.7	59.3
1995-99		24.3	9.2	10.9	47.2	65.8
2000-04		23.8	5.1	14.8	42.1	66.8
2005-09*		18.8	4.0	9.2	46.3	67.1

* 2005-2008 for total, flood and drought affected areas up to 2008 only
IA-Irrigated Area data upto 2009; PIA Power Irrigated Area - data up to 2007
Source: Table A6.2 & A6.3

Turning to the total sown area (TSA) the decline from the pre-reform period continued up to 1984, before gradually rising until 1990 to reach almost 150 million ha. The next peak is recorded for the year 1998 - 146.4 million ha. Data on total sown area, multiple cropping index (MCI) and irrigated areas are presented in Table A6.1d. In the first phase of reforms (1978-84) the net reduction in TSA was of the order of 4.85 million ha. But between 1985 and 1998, the net addition was almost 12.75 million ha, but this was followed by a net fall of 4.2 million ha during 1999 to 2006. Despite reductions in TSA in 12 out of the 32 years, there was a net addition over the period to the extent of 10.16 million ha or about 7 per cent. MCI (expressed as a ratio of sown area to cultivated area) estimated with FAO and USDA series on cultivated areas show divergence during 1983-1996 conforming exactly to the years in which the series were revised. For the periods 1978-82 and 1997-2003 they are almost identical, but the indices in the latter period (using both the series) are significantly lower - beginning with almost 1.5 in 1978 to 1.2.[9] But clearly in both periods MCI was falling.

The decline in the earlier period followed the trend since 1976 when the government recommended reduction on 'economic grounds'. In this regard, Walker (1993:165) notes, "[T]he reduction of multiple cropped area was encouraged by the Chinese government after 1976, mainly on economic grounds. The government came to recognize that the cost of maintaining the high multiple crop indices prevailing in the late 1970s were detrimental to peasants' incomes and their incentive to produce. Once the household became the unit of management in Chinese agriculture in the

9 Since the trends in the value of the MCI result from the combined effect of variations in both cultivated and sown areas, a reduction in the former increases the value of MCI if there is less than a proportionate fall in the latter. For the period 1983-1996, the divergence in the two series (USDA and FAO) is purely statistical. Therefore, comparing the periods before and after this period, it can be inferred that MCI was gradually falling.

early 1980s, it was inevitable that peasants themselves would examine their cropping practices from the standpoint of profitability." Walker also notes that contraction of arable area was associated with contraction of the area under multiple cropping. Between 1978 and 1986 multiple cropped area decreased by 3.545 million ha. In addition to the reduction in arable area during the same period, to the extent of 3.219 million ha, the total sown area declined by 6.764 million ha. The percentage decline of arable and total sown area per head during 1978-88 was 15.9 per cent and 15.7 per cent respectively. The regional figures show wide variations, with higher figures for the south and central provinces - a reduction of 26.7 per cent and 16.6 per cent respectively during 1978-88. A reversal however began post-2003, with the indices rising owing both to a reduction in cultivated area and an increase in sown area but still at a level lower than 1.3.

Trends in irrigated areas during the period 1978-2009 show a reduction in the first phase of reforms falling by close to a million ha (or 2 per cent) between 1979 and 1985. Nickum (1995) attributes this to three factors; normal capacity reduction due to aging of reservoirs and infrastructure, decline in pump-irrigated areas due to inoperability or technical reasons and irrigated land diverted to non-agricultural uses. In the next five years however, there was a recovery of close to 3.37 million ha with the major increase occurring in 1990 (2.5 million ha). During 1986-2009, irrigated area grew at an annual average rate of over 1.2 per cent. The corresponding net addition over the same period was over 15 million ha.

6.2 COMMERCIALIZATION AND CHANGES IN THE COMPOSITION OF AREA SOWN

The more significant and serious developments in post-1978 Chinese agriculture relate to changes in the distribution of sown areas across various crops. Table 6.2a compiles three-year average shares of sown areas of various grain crops in total sown area. The area under grain crops (that includes besides all cereals, soybeans and tubers) that stood at 81 per cent of TSA during 1978-81, fell gradually over the next 3 decades to 69 per cent during 2007-09. In absolute terms, this amounted to a reduction by over 11.6 million ha. Among the grain crops however, corn and soya beans expanded their shares at the cost of other grains. The share of non-food crops also fell from around 10 per cent to just 1.7 per cent in 2009. Correspondingly, non-grain food crops in TSA rose dramatically from just over 9 per cent to almost 30 per cent in the same period. Among the non-grain food crops, as a share in TSA, between 1978 and 2009, area under fruit crops rose 7 times (from 1 per cent to 7 per cent),

vegetable sown area expanded almost 4.5 times (2.5 per cent to 11.6 per cent) while oil crops more than doubled (4 per cent to 8.6 per cent). The share of non-food crops fell sharply from 9.7 per cent to 1.7 per cent (Tables A6.4 & A6.5).

Table 6.2a: China: Composition of Total Sown Area 1978-2009 (proportions)-3-year averages

	Rice	Wheat	Corn	Soybean	Tubers	other Grain	Total Grain	Non-grain Food	Total Food	Non-food
1978-79	0.232	0.197	0.134	0.048	0.079	0.122	0.812	0.091	0.903	0.097
1980-82	0.231	0.197	0.134	0.055	0.067	0.112	0.797	0.113	0.910	0.090
1983-85	0.228	0.203	0.127	0.052	0.062	0.104	0.777	0.130	0.907	0.093
1986-88	0.221	0.200	0.135	0.057	0.061	0.088	0.762	0.162	0.923	0.077
1989-91	0.220	0.205	0.142	0.055	0.061	0.073	0.756	0.171	0.927	0.073
1992-94	0.208	0.201	0.141	0.076	0.062	0.051	0.739	0.195	0.934	0.066
1995-97	0.203	0.192	0.154	0.071	0.063	0.043	0.726	0.224	0.950	0.050
1998-2000	0.197	0.182	0.158	0.076	0.066	0.036	0.716	0.251	0.967	0.033
2001-03	0.181	0.153	0.158	0.084	0.065	0.030	0.672	0.287	0.959	0.041
2004-06	0.187	0.148	0.174	0.082	0.058	0.025	0.674	0.284	0.958	0.042
2007-09	0.187	0.153	0.193	0.077	0.054	0.022	0.686	0.287	0.974	0.026

Source: Table A6.4

As regards absolute changes of sown area under various crops, there are 6 distinct periods that can be identified with alternating absolute reductions and increases for the grain crops as a whole (Table 6.2b). Sown areas under soybeans followed an opposite trend in both sub-periods as well as over the entire period. The areas under corn and soybean however, increased by 11.2 million ha and 4.8 million ha respectively over 1978-2009. The largest loss of sown areas – 14.78 million ha - was in the category of other grains, which comprised mainly coarse grains (millets, sorghum, barley etc) but the trend followed the same pattern from the 1960s. Examining the periods sequentially, it can be seen that in the initial phase of reforms (1978-85) the reduction in grain-sown area (11.74 million ha) was more than that in the entire period. Coarse grains (including corn) accounted for the highest reduction (6.67 mill. Ha) followed by tubers and rice together (over 5.5 million ha). Correspondingly, the increase in sown areas under non-grain food crops together was over 8 million ha). Among the non-grain food crops (particularly commercial and superior), there were large increases in areas sown of oilseeds (5.58 million ha, fruits and vegetables (more than a million ha each).

Table 6.2b: China: Changes in Sown Areas of Various Crops 1978-2009 (various periods)

Grain Crops, 1000 ha							
	Rice	**Wheat**	**Corn**	**Soybean**	**Tubers**	**Oth.Grains**	**Total**
1978-85	-2351	35	-2267	574	-3224	-4509	-11742
1986-90	994	1535	3707	-159	549	-2007	4621
1991-94	-2893	-1773	-249	5177	150	-5333	-4922
1995-98	1042	793	4087	-1065	730	-343	5243
1999-2003	-4706	-7777	-1171	1228	-298	-1653	-14377
2003-2009	3119	2294	7114	-950	-1066	-936	9575
1978-2009	-4794	-4892	11221	4805	-3160	-14782	-11602
Non-Grain Crops, 1000 ha							
	Cotton	**Oilcrops**	**Sugar Crops**	**Tobacco**	**Vegetables**	**Tea**	**Fruit**
1978-85	274	5578	421	529	1017	31	1080
1986-90	447	-900	384	280	1585	16	2443
1991-94	-60	1181	76	-103	2583	74	2085
1995-98	-1069	838	230	-129	3372	-78	1271
1999-2003	651	2071	-327	-97	5661	150	902
2003-2009	-159	-1338	226	128	461	641	1703
1978-2009	85	7430	1010	608	14678	835	9484

Source: Table A6.6

In the second period (1986-1990) there was a net gain in the sown areas of all crops except soybean, oil crops and coarse grains (excluding corn). For the grain crops, the net additions were far lower than the loss in the earlier period over the previous period except in the case of corn and wheat whose sown areas together increased by over 5.2 million ha. The increases of area under fruits and vegetables were higher than in the earlier period – together amounting to over 4 million ha. By the end of the third phase 1991-94, cumulative reductions in total grain sown area was over 12 million ha with rice, tubers and wheat together amounting to nearly 7 million ha, while coarse grain (excluding corn) sown area had contracted by 11.8 million ha. The increase in corn and soybean sown areas together was nearly 6.8 million ha. The cumulative increase in the case of vegetables, fruits and oil crops was over 16.6 million ha. In the next two phases – 1995-98 and 1999-2003 – the net reduction in grain-sown area was over 9 million ha. The significant reduction in these two phases was in the case of wheat (nearly 8 million ha) and tubers (1.3 million ha) and the corresponding increases were in vegetables (over 9 million ha) and fruit and oil crops together (4 million ha). In the last period 2003-09, grain sown area increased by 9.5 million ha. For the entire period non-grain food crop area had expanded by over 33.4 million ha.

Complex interactive and cumulative effects of agricultural price and non-price policies, along with the expansion of markets for products that were relatively outside the scope of these policies, appear to explain the changes in sown areas discussed above. Between 1978 and 1992, the overall procurement price index for agricultural and sideline products rose at an annual average rate of over 7 per cent. During the same period the purchasing price indexes of grain grew at the rate of 8.57 per cent. The marketed proportion of food grains, which was around 23 per cent of the total output in the early 1980s, rose to 34 per cent during 1984-91. Along with improving price incentives, the government removed several items from its procurement lists from 1978 onwards. Also procurement quotas fell in terms of total volume and proportion of output. Grain and cotton procured by designated state agencies fell from 70 per cent of total produce in 1978 to 34 per cent by 1992 and those by rural supply and marketing co-operatives from 32.6 per cent to 11.7 per cent respectively.[10]

Although in the period 1978-90 official grain prices were increased across various crops in stages and compulsory delivery quotas for certain grains and additional price incentives for above quota deliveries were put in place, these do not seem to explain the reduction in grain sown area – in fact it raises a paradox. However, sown areas cannot be adjusted instantly with price changes either effected by the government or arising from market pressures or a combination of the two. Further, prices of non-grain crops whose markets were expanding had a far stronger effect leading to the diversion of areas away from grain. Corn was an exception amongst the grain crops as regards changes in sown areas, because it was increasingly emerging as an important feed grain with the expanding demand for animal products. (Thus, total corn demand is a function of both direct and indirect demand – in the form of feed for meat production. This is discussed in detail in the next chapter).

As regards rice, Tian (2000a) notes that rice production is not independent of other crops in a sequence of combinations over the annual agricultural cycle. The multiple cropping patterns that developed over a long period of time, were based on considerations of maintaining and enhancing productivity, while at the same time ensuring ecological sustainability. This combined with resource specificity, reduces supply responsiveness of rice production to market signals. Tian (2000a) models the changes in rice sown area as determined by costs of inputs including labour, technical progress in rice production, competition for resources from non-grain production and from the non agricultural sector. Results of the model indicate rice area declining in regions with relatively high labour costs and fast growing industrial sector or prosperous regions (See also Tian (2000b). The large declines in grain-sown

10 Moreover, sales of consumer goods by designated state authorities as a proportion of total retail sales in rural areas fell from 80.2 per cent in 1978 to 31.6 per cent by 1992. (Sicular, 1995: 1031)

areas by the early 1990s brought about an important policy initiative almost identical to the local grain sufficiency policy of the 1960s and the 1970s in the form of the governor grain responsibility system (discussed in chapter 5 section 5.1 above).

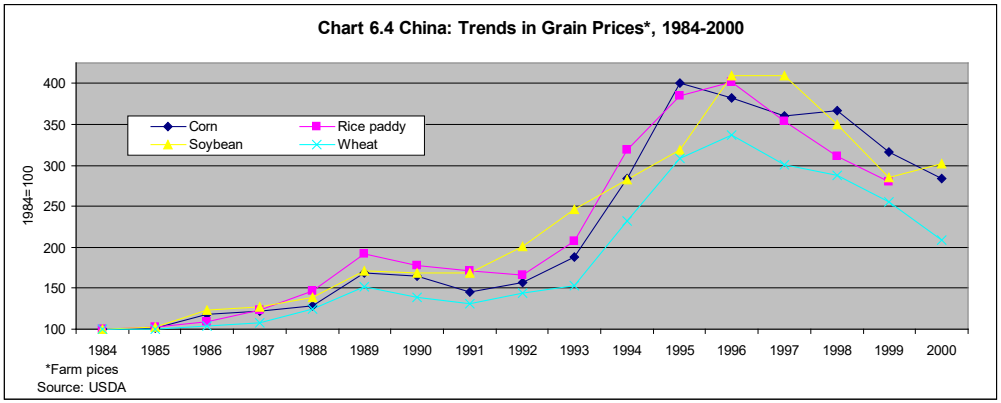


Table 6.2c: Growth in Procurement Prices, 1978-94 (% p.a)

	1978-84	1985-94	1978-94
Overall Index	6.24	8.89	1.84
Oil crops	30.24	9.34	11.33
Cotton	31.25	11.6	11.55
SC&BR*	31.75	9.15	12.13
Grain	9.96	8.71	8.57
Wheat	7.93	7.13	6.08
Rice	7.16	9.98	7.97
Corn	7.77	8.55	7.3
Sorghum	7.6	9.08	9
Soybeans	16.42	10.15	10.46

Source: China Statistical Yearbook 1995 and earlier issues
*Sugarcane and Beetroot

Table 6.2c indicates the extent to which prices were used by the government to influence cropping pattern and production of certain key agricultural products during 1978-94. Chart 6.4 maps the trends in the farm prices of some grain crops for the period 1984-2000. Steep increases in grain prices in 1994 led to a reversion to dual track pricing (higher prices for above-quota supplies discussed in the previous chapter section 5.1) but between 1997 and 2000, prices fell steeply. The complex relationship between procurement prices, market prices and non-price policies, aimed at altering production in a desired direction cannot be examined with regard to

sown areas alone. The ultimate effect is in the changes to output, which is examined in the next section.

6.3 TRENDS IN INPUTS AND AGRICULTURAL OUTPUT

Before examining agricultural production, it is relevant to discuss the growth in capital and intermediate inputs during the reform period. Table 6.3a presents data on agricultural machinery and chemical fertilizer utilization for the period 1978-2009. In Table 6.3b, the estimated trend of annual growth rates of these variables, are compiled for the periods 1978-94 and 1995-2009. Sustained and stable growth of over 6 per cent was recorded for total agricultural machinery (measured in terms of total power) for both periods. As regards rural electricity generating capacity, the latter period recorded over 14 per cent - 10 percentage points greater than in the former period.

Table 6.3b: China: Growth Rates of Mechanical and Intermediate Agricultural Inputs, 1978-2009

	1978-94	1995-2009	1978-2009
Agricultural Machinery (Total power)	6.4	6.1	6.1
Large and Medium Tractors (nos.)	0.6	11.3	3.0
Small and Walking Tractors (nos.)	11.9	4.7	7.8
Rural Electricity Generation (Capacity)	4.0	14.1	6.7
Rural Electricity Consumption	10.5	10.0	10.4
Nitrogenous Fertilizers (application)*	5.4	0.7	3.3
Phosphate Fertilizers (application)*	5.6	1.4	4.0
Potash Fertilizers (application)*	13.4	5.2	9.8
Compound Fertilizers (application)**	19.6	6.5	12.0
Total Fertilizer Application	7.1	2.7	5.1
Fertilizer Application per hectare	6.8	2.6	4.8

* Data for 1979-2009; ** Data for 1980-2009
Source Data: Table A6.7

As regards the application of fertilizer, growth slowed down significantly during 1995-2009 for all forms of fertilizers. Fertilizer application per ha of land grew by close to 7 per cent during 1978-94 but fell sharply to just 2.6 per cent during 1995-2009. This is partly explained by the fact that the initial level of application (in 1978) was very small. But it is significant to note that compound fertilizer growth was impressive even though it had fallen to a third of the rate achieved during the earlier period. All the three conditions required for the technical transformation of agriculture, namely, high-yielding fertilizer responsive varieties, water availability

and adequate fertilizer application; seem to have progressed considerably at least until the mid 1990s. But it must be emphasized here that apart from the last condition, the other two were already well advanced even before reforms. Though, the availability of chemical fertilizers was lower in the pre-reform period, investments in large scale plants (imported) had already been made by 1976 and these had begun to expand supplies in the early 1980s. Besides, enormous quantities of organic manure were applied to restore soil quality and fertility in pre-reform China. In this regard, Stone (1993:346) notes that following reforms, the movement of labour out of farming significantly affected the labour-intensive activity of application of organic manure. The movement of labour out of agriculture and the decline in rural employment as a share of total employment (from over 76 per cent to 60 per cent between 1978 and 2009) were significant during the economic transition in post-1978 reform China. Statistical data on rural labour however, does not provide a complete picture of the movements across sectors or its distribution, or from rural to urban sectors.

Table 6.3a: China: Mechanical and Intermediate Inputs in Agriculture, 1978-2009

	Tractors and mechanical power			Rural electricity			Fertilizers effective application			10000 tons	
	(10000kw)	Tractors (10,000)		Capacity 10000kw	Consumed bill. Kwh	Nitro-genous	Phosphate	Potash	Compound	Total	Application per hectare
	Total Power	Large and Medium	Mini-Tractors								
1978-79	12565	61	152	252	27	826	224	32	27.2	985	67
1980-84	16912	81	245	340	40	1060	319	52	73	1503	104
1985-89	24668	86	523	402	65	1360	369	94	218	2041	140
1990-94	30805	75	758	470	113	1768	531	193	468	2959	199
1995-99	42177	71	1031	583	193	2151	672	318	781	3922	253
2000-04	58018	96	1348	853	308	2171	712	421	1051	4354	283
2005-09	77439	234	1637	2870	532	2284	773	528	1500	5089	328
						1978 not available			1980 value		
Indices											
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	134.6	132.1	160.9	134.8	147.8	128.3	142.6	164.5	268.4	152.6	155.8
1985-89	196.3	141.1	343.6	159.1	243.1	164.6	165.0	298.4	802.4	207.2	209.2
1990-94	245.2	123.2	498.2	186.2	420.6	214.0	237.4	610.7	1720.2	300.4	297.2
1995-99	335.7	115.7	677.3	231.0	721.5	260.4	300.7	1007.2	2871.8	398.1	378.4
2000-04	461.8	157.3	885.9	337.9	1149.0	262.9	318.4	1331.5	3864.5	442.0	423.0
2005-09	616.3	381.9	1075.9	1137.2	1985.7	276.6	345.8	1672.4	5514.2	516.6	490.2
Change over periods (%)											
1978/79-1980-84	34.6	32.1	60.9	34.8	47.8	28.3	42.6	64.5	168.4	52.6	55.8
1980/84-1985/89	45.9	6.8	113.5	18.0	64.5	28.3	15.7	81.4	199.0	35.8	34.2
1990/94-1995/99	24.9	-12.7	45.0	17.0	73.0	30.0	43.9	104.7	114.4	45.0	42.1
1990/94-1995/99	36.9	-6.1	36.0	24.0	71.6	21.7	26.6	64.9	66.9	32.5	27.3
1995/99-2000/04	37.6	36.0	30.8	46.3	59.3	0.9	5.9	32.2	34.6	11.0	11.8
2000/04-2005/09	33.5	142.7	21.4	236.6	72.8	5.2	8.6	25.6	42.7	16.9	15.9

Source: Table A6.7

Trends in the share of agriculture in rural employment presented in Table 6.3c, shows a continuous decline over the period 1981-2009 from around 94 per cent to 62 per cent. However, there was an absolute growth in the numbers of rural labour, from over 306 million to almost 468 million between 1978 and 2009. Township and village enterprises (TVE) which were a 're-incarnation' of rural commune and brigade industries in pre-reform China, absorbed an increasing proportion of labour released form agriculture, with their share rising from just over 9 per cent of total rural labour in 1978 to over 33 per cent by 2009. As the table shows, this leaves a residual amounting to 10 per cent in 1990, falling to less than 7 per cent in some years between 1993 and 2000 but still around 8.8 per cent in 2005.

Table 6.3c: China: Rural Labour and Emloyment, 1978-2009, 10000 Persons

	Rural Labour				Share in Total Rural Labour		
	Total	FFAHF	TVE	Residual	FFAHF	TVE	Residual
1978	30638	28456	2827	-645	0.929	0.092	-0.021
1979	31025	29072	2909	-956	0.937	0.094	-0.031
1980	31836	29808	3000	-972	0.936	0.094	-0.031
1981	32672	30678	2970	-976	0.939	0.091	-0.030
1982	33867	31153	3113	-399	0.920	0.092	-0.012
1983	34690	31645	3235	-190	0.912	0.093	-0.005
1984	35968	31685	3848	435	0.881	0.107	0.012
1985	37065	30352	6979	-266	0.819	0.188	-0.007
1986	37990	30468	7937	-415	0.802	0.209	-0.011
1987	39000	30870	8805	-675	0.792	0.226	-0.017
1988	40067	31456	9545	-934	0.785	0.238	-0.023
1989	40939	32441	9367	-868	0.792	0.229	-0.021
1990	47708	33336	9265	5107	0.699	0.194	0.107
1991	48026	34186	9609	4231	0.712	0.200	0.088
1992	48291	34037	10625	3629	0.705	0.220	0.075
1993	48546	33258	12345	2942	0.685	0.254	0.061
1994	48802	32690	12017	4094	0.670	0.246	0.084
1995	49025	32335	12862	3828	0.660	0.262	0.078
1996	49028	32260	13508	3259	0.658	0.276	0.066
1997	49039	32678	13050	3311	0.666	0.266	0.068
1998	49021	32626	12537	3858	0.666	0.256	0.079
1999	48982	32912	12704	3366	0.672	0.259	0.069
2000	48934	32797	12820	3317	0.670	0.262	0.068
2001	49085	32451	13086	3548	0.661	0.267	0.072
2002	48960	31991	13288	3682	0.653	0.271	0.075
2003	48793	31260	13573	3960	0.641	0.278	0.081
2004	48724	30596	13866	4262	0.628	0.285	0.087
2005	48494	29976	14272	4246	0.618	0.294	0.088
2006	48090		14680			0.305	
2007	47640		15090			0.317	
2008	47270		15451			0.327	
2009	46875		15588			0.333	

FFAHF –Farming, forestry, animal husbandry and fisheries
Source: China Statistical Yearbook, various years

The declining role of government expenditure towards agriculture in the post-reform period has been a matter of serious concern. The various components of this expenditure is presented in Table 6.3d. As a share in total government expenditure, agriculture accounted for, on average, over 13 per cent of total government expenditure during 1978-80 but fell below 9 per cent between 1999-2009 (except in 2004 at 9.7 per cent). Capital construction expenditure during the entire period, (which is vital for expanding and/or maintaining agricultural capital resources, (including land), shows a similar pattern as expenditure on agriculture. During 2004-06, capital construction as a share of expenditure on agriculture averaged 20 per cent, significantly below the levels during 1978-80 (34 per cent) or 1998-2001 (35 per cent). Investment in fixed assets in agriculture, as a share of total fixed investment in all sectors during 2003-2009 was on average a mere 2.8 per cent.

Table 6.3d: China: Government Expenditure on Agriculture, 1978-2009, 100 Million Yuan

	Expenditure on Agriculture						
	Total	**Share (%) ***	**Rural Production**	**Capital Construction**	**CC Share****	**Science & Technology**	**Rural Relief**
1978	150.7	13.4	77.0	51.1	33.9	1.1	6.9
1979	174.2	13.7	90.0	62.4	35.8	1.5	9.0
1980	150.0	12.2	82.1	48.6	32.4	1.3	7.3
1981	110.2	9.9	73.7	24.2	21.9	1.2	7.4
1982	120.5	10.4	79.9	28.8	23.9	1.1	8.0
1983	132.8	10.3	86.7	34.3	25.8	1.8	8.7
1984	141.3	9.1	95.9	33.6	23.8	2.2	9.6
1985	153.6	7.7	101.0	37.7	24.6	2.0	12.9
1986	184.2	7.9	124.3	43.9	23.8	2.7	12.4
1987	195.7	8.0	134.2	46.8	23.9	2.3	13.4
1988	214.1	7.9	158.7	39.7	18.5	2.4	15.9
1989	265.9	9.4	197.1	50.6	19.0	2.5	15.7
1990	307.8	10.0	221.8	66.7	21.7	3.1	16.3
1991	347.6	10.3	243.6	75.5	21.7	2.9	25.6
1992	376.0	10.0	269.0	85.0	22.6	3.0	19.0
1993	440.5	9.5	323.4	95.0	21.6	3.0	19.0
1994	533.0	9.2	399.7	107.0	20.1	3.0	23.3
1995	574.9	8.4	430.2	110.0	19.1	3.0	31.7
1996	700.4	8.8	510.1	141.5	20.2	4.9	43.9
1997	766.4	8.3	560.8	159.8	20.8	5.5	40.4
1998	1154.8	10.7	626.0	460.7	39.9	9.1	58.9
1999	1085.8	8.2	677.5	357.0	32.9	9.1	42.2
2000	1231.9	7.8	766.9	414.5	33.6	9.8	40.4
2001	1456.7	7.7	918.0	480.8	33.0	10.3	47.7
2002	1580.8	7.2	1102.7	423.8	26.8	9.9	44.4

	Expenditure on Agriculture						
	Total	**Share (%) ***	**Rural Production**	**Capital Construction**	**CC Share****	**Science & Technology**	**Rural Relief**
2003	1754.5	7.1	1134.9	527.4	30.1	12.4	79.8
2004	2337.6	9.7	1693.8	542.4	23.2	15.6	85.9
2005	2450.3	7.2	1792.4	512.6	20.9	19.9	125.4
2006	3173.0	7.9	2161.4	504.3	15.9	21.4	182.0
2007	3404.7	6.8					
2008	4544.0	7.3					
2009	6720.4	8.8					

*Share in Total Government Expenditure on all sectors, ** CC share is share in government expenditure of capital construction in agriculture.

Source: China Statistical Yearbook, various years

The transition from a collective production system to one based on household farming has entailed the loss of previously available collective resources for investment and it is difficult to assess the extent to which individual household investment compensated for that loss. Data in Table 6.3d does point to a vastly diminished priority for the government as regards agriculture, but the progressive decentralization of public finance and administrative authority since the early nineties, meant that central resources would account only for a part of total investment in agriculture. As will be shown below, conditions in the farming sector as regards output were by no means robust in the period after 2003 and the role of the government or its gradual withdrawal can be considered an important factor for the same.

Farm Output

Growth of agricultural output was rapid in the first phase of reforms, but in subsequent periods excepting some products such as fruits, corn and tea, the rates had slowed down considerably. Table 6.3e presents these rates for sub-periods during 1978-2009. Except in the case of tubers with a decline in output, during 1978-84, all crops recorded high growth rates with non-grain crops growing much faster. Oil crops, sugarcane, cotton and tobacco expanded by over 10 per cent p.a. Grain production expanded by 4.6 per cent p.a. owing to an almost 8 per cent growth rate of wheat. In the second sub-period 1985-96, except fruit production, soybeans tubers and corn, the growth rates of all other crops fell sharply. Growth of grain production was less than half (2.2 per cent p.a) that during 1978-84 and the growth of rice was less than a quarter (at below 1 per cent per annum compared to 4.5 per cent). The growth rates of fruit production almost doubled (starting from a very small base) from 6.9 per cent to over 12 per cent in the first two sub-periods while tuber production recovered from declines in the earlier period to grow at 2.5 per cent p.a.

Table 6.3e: China: Trend Growth Rates of Various Agricultural Products, 1978-2009

	1978-84	1985-96	1997-09	1978-96	2003-09	1978-2009
Grain	4.6	2.2	0.5	2.4	3.2	1.5
Cereals (FAO)*	4.8	2.5	0.1	2.7	5.1	1.6
Rice	4.5	0.9	-0.3	1.7	2.7	0.7
Wheat	7.9	2.2	-0.1	3.7	4.9	1.7
Corn	3.7	5.4	3.3	4.2	5.8	3.4
Soybean	5.0	5.8	0.0	5.1	-2.5	3.6
Tubers	-1.2	2.5	-1.9	0.6	-3.7	0.7
Oil-crops	13.9	4.1	1.8	6.5	0.3	4.8
Peanuts	10.3	5.2	1.8	6.9	0.6	5.6
Rapeseed	15.9	4.8	2.5	7.3	0.6	5.1
Seasame	3.9	0.2	-1.4	2.6	-1.2	2.2
Sugarcane	11.1	3.5	4.0	6.8	5.9	4.9
Beetroot	20.0	5.2	-4.3	7.9	5.9	1.4
Vegetables	7.5	7.2	6.5	7.9	2.4	7.9
Fruit	6.9	12.1	13.5	11.2	5.7	12.0
Cotton	17.7	1.1	5.1	3.1	5.2	2.6
Tobacco	10.0	3.1	-0.6	6.2	4.1	2.4
Tea	8.2	2.6	6.6	4.5	9.8	4.2

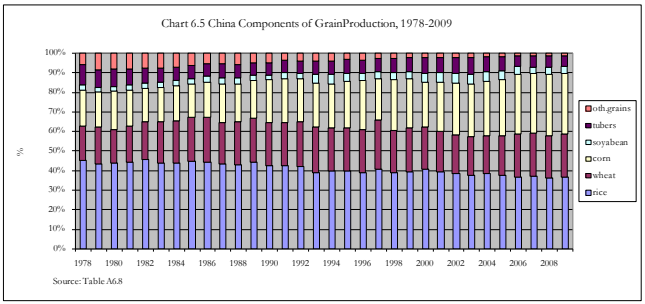
* 1978-2007; *Source:* Table B6.1

The growth rates in the third period (1997-2009) were even lower than during 1985-96 especially of grain crops. Rice, wheat and tuber outputs declined on average while soybeans recorded no growth. The only exception was corn at 3.3 per cent p.a. Sugarcane and oil seeds recorded positive growth rates (at 4 per cent and 1.8 per cent) while fruit production grew at its highest post-reform rates (13.5 per cent p.a).

It is interesting to observe the shifts that occurred among grain crops. Though rice continues to be the major grain crop both in terms of acreage and proportion of output, the share of wheat and corn increased significantly. In 1978 the shares of the three crops, rice, wheat and corn (by weight) in total grain output were 45 per cent, 17.5 per cent and 18.4 per cent respectively. Chart 6.5 depicts the trends in the shares of all the grain crops. The share of rice consistently fell over the entire period to account for 36.8 per cent in 2009 while wheat share was marginally higher (21 per cent) but the share of corn rose by 12 percentage points to almost 31 per cent. While minor grains and coarse grains (excepting corn) together fell from an already low figure of 6 per cent to just 1.4 per cent in 1978 and 2009 respectively, that of tubers was halved (10.4 per cent to 5.6 per cent) and that of soybeans marginally increased from 2.5 per cent to 3.6 per cent.

It is clear that the shift towards production of commercial crops was very rapid and at the cost of grain production. After 1985 when the growth in grain production

began to taper, the government introduced measures to reverse the trend.[11] But as the data shows, the effect was the opposite of what was desired officially. Not only did grain production begin to stagnate (or even decline in availability per capita), an increasing proportion of grain was diverted towards feed or to meat production.



The transfer of sown areas away from grain towards production of 'superior' food crops such as vegetable oil or fruits has been interpreted as a diversification of agricultural production based on comparative advantage (Zhang, 2000). But a more fundamental diversification of the agricultural sector concerns the growth of animal husbandry and fisheries in post-reform China. Chart 6.1 discussed earlier provided the basic picture as regards the overwhelming contribution to value added by these sectors. Table A6.9 compiles official data on trends in the outputs of animal products as well as data from the FAO's supply and utilization accounts. There is a minor discrepancy between the two series as regards the total meat output arising out of varying ratios used for estimating meat quantities from carcass weight.[12] But the more significant problem relates to the breakdown of total meat into pork, beef and mutton that equals total meat in the official data (*China Statistical Yearbook*) and is erroneous for the period 1978-96. As regards production of aquatic products, the official data has been readjusted downwards by an average 13 per cent across all products for the period after 1996. The FAO data series are more consistent and useful in examining trends or for analytical exercises (For this reason the FAO figures are used to calculate growth rates in fishery products).

Production data on the main items in the animal husbandry sector from the FAO dataset and their growth rates estimated using both FAO and official sources,

11 For example, a special tax was levied on producers of high-value crops such as fruit and a grain development fund was established.

12 There are other technical aspects of estimating the weight of meat that can be extracted from a certain weight of an animal. Further, some animal parts may be deemed inedible by international standards but may be consumed in China.

are presented in Table 6.3f and in Table 6.3g respectively. Pork continues as the dominant meat though its share declined from 79 per cent in 1978 to 64 per cent in 2007. But poultry meat grew rapidly from a small base to increase its share in total meat from 13.8 per cent to 21.4 per cent in the respective years. The growth rates of animal husbandry products reveal a significant slowdown in the period 1997-2009 compared to 1978-1996, except in the case of cow-milk. The slowdown is similar to that observed for grain production and reveals the close relationship between grain and meat.

Table 6.3f: China: Production of Animal Products, 1978-2009, 1000 Tons

	Meat-tot	Beef	Mutton	Pork	Poultry	Other Meat
1978-79	12221	299	349	9820	1561	192
1980-84	16467	383	517	13540	1810	218
1985-89	24547	821	740	19946	2730	310
1990-94	37095	1981	1271	27987	5384	471
1995-99	54033	4303	2113	36675	10122	821
2000-04	67055	5735	3150	43893	13247	1029
2005-07	71434	5881	3659	46049	14460	1386
Indices						
	Meat-tot	**Beef**	**Mutton**	**Pork**	**Poultry**	**Other Meat**
1978-79	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	134.7	128.1	148.1	137.9	115.9	113.5
1985-89	200.9	274.8	212.1	203.1	174.9	161.3
1990-94	303.5	663.1	364.3	285.0	344.9	245.0
1995-99	442.1	1440.2	605.3	373.5	648.4	427.5
2000-04	548.7	1919.5	902.7	447.0	848.6	535.8
2005-07	584.5	1968.4	1048.4	468.9	926.3	721.4
Change Over Periods (%)						
	Meat-tot	**Beef**	**Mutton**	**Pork**	**Poultry**	**Other Meat**
1978/79-1980-84	34.7	28.1	48.1	37.9	15.9	13.5
1980/84-1985/89	49.1	114.6	43.3	47.3	50.9	42.2
1990/94-1995/99	51.1	141.3	71.8	40.3	97.2	51.8
1990/94-1995/99	45.7	117.2	66.2	31.0	88.0	74.5
1995/99-2000/4	24.1	33.3	49.1	19.7	30.9	25.3
2000/04-2005/07	6.5	2.5	16.1	4.9	9.2	34.6

Source: Table A6.9

In the fishery sector too, the slowdown is evident though to a lesser extent. But as in the case of meat, the composition of various aquatic products altered significantly. The share of freshwater fish doubled between 1978 and 2007 – from 19.9 per cent to 41 per cent while that of marine fish was more than halved – from nearly 57 per cent to 21.4 per cent. The main reason is evidently an increase in artificial freshwater

fisheries, which is favourable for employment generation as well as value addition. The remaining categories of aquatic products grew rapidly in both periods to increase their share from 23 per cent in 1978 to almost 38 per cent by 2009.

Table 6.3g: China: Growth of Animal Husbandry and Fisheries, 1978-2009

***CSY* Data**			
	1978-1996	**1997-2009**	**1978-2009**
Meat-total	8.5	2.6	7.2
Pork		2.1	
Beef		2.7	
Mutton		5.1	
Cow milk	10.9	17.6	11.4
Other milk	9.6	6.9	6.6
Eggs	12.7	2.7	8.2
FAO Data			
	1978-1996	**1997-2007**	**1978-2007**
Meat-total	8.1	2.6	6.8
Beef	15.3	2.7	12.6
Mutton	9.3	5.7	8.9
Pork	7.2	2.0	5.7
Poultry	10.4	3.3	9.5
Other meat	8.1	6.9	7.8
FAO Data			
	1978-91	**1992-2007**	**1978-2007**
Fish, Marine	9.4	5.4	8.9
Freshwater Fish	14.0	6.5	10.7
Demersal Fish	2.0	6.3	6.1
Pelagic Fish	8.1	4.9	8.2
Marine Fish, Other	5.1	-3.1	3.4
Aquatic Plants	2.5	7.9	9.1
Aquatic Products, Other	2.7	7.9	9.3
Crustaceans	7.9	7.6	8.5
Cephalopods	10.0	8.8	8.2
Molluscs, Other	15.4	5.8	12.5

Source: Table 6.3f and FAO

The per capita production of meat and aquatic products is presented in Table 6.3h that shows a five-fold increase in meat and a six-fold increase in aquatic products.

The decline in sown areas of grain and the average growth of food grains for 1978-2009 at just 1.5 per cent p.a, combined with the population growing at close to 1.1 per cent, has again brought up the long-term historical challenge that China has faced – food availability.

Table 6.3h: China; Per Capita Output of Meat and Aquatic Products, 1978-2007 (kgs)

	Meat Products			Aquatic Products			
	Meat-total	**Pork**	**Poultry**	**Total**	**Freshwater**	**Marine**	**Other**
1978-79	13	10	2	6	1	3	1
1980-84	16	13	2	6	2	3	1
1985-89	22	18	2	10	4	4	3
1990-94	32	24	5	16	6	5	5
1995-99	44	30	8	29	11	8	10
2000-04	52	34	10	34	13	8	12
2005-07	54	35	11	34	14	8	13
Indices							
	Meat Products			**Aquatic Products**			
	Meat-total	**Pork**	**Poultry**	**Total**	**Freshwater**	**Marine**	**Other**
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	128.5	131.5	110.5	110.0	142.4	95.7	115.2
1985-89	177.9	180.0	154.5	182.7	306.4	115.3	234.0
1990-94	250.7	235.6	284.3	284.1	473.4	169.1	391.7
1995-99	346.6	292.9	507.9	509.4	889.3	266.0	756.0
2000-04	414.2	337.4	640.4	591.1	1079.0	264.8	941.6
2005-07	431.2	345.9	682.9	606.2	1167.8	241.4	982.9
Change Over Periods (%)							
	Meat Products			**Aquatic Products**			
	Meat-total	**Pork**	**Poultry**	**Total**	**Freshwater**	**Marine**	**Other**
1978/79-1980-84	28.5	31.5	10.5	10.0	42.4	-4.3	15.2
1980/84-1985/89	38.4	36.9	39.8	66.1	115.2	20.5	103.1
1990/94-1995/99	41.0	30.9	84.0	55.5	54.5	46.7	67.4
1990/94-1995/99	38.2	24.3	78.6	79.3	87.9	57.3	93.0
1995/99-2000/4	19.5	15.2	26.1	16.0	21.3	-0.5	24.6
2000/04-2005/07	4.1	2.5	6.6	2.5	8.2	-8.8	4.4

5 year averages except for 1978-9; *Source:* Table A7.6 (chapter 7)

Tian (2000b) examines technical efficiency[13] of the grain sector for the period 1978-95 and found the following:

1. Labour productivity was low across all grain crops
2. Marginal productivity of fertilizer application became low and declining rapidly for rice and corn with increasing environmental costs.
3. Irrigation and disaster control hold huge potential for increasing grain output but involve high costs under the reformed institutional framework.
4. Increasing cropping intensity could increase output but were economically unviable.

13 Using stochastic frontier production function (based on random probability distribution) which limits precise predictability.

Further potential for growth in grain production would therefore require technological progress, as the problem is not one of technical inefficiencies.

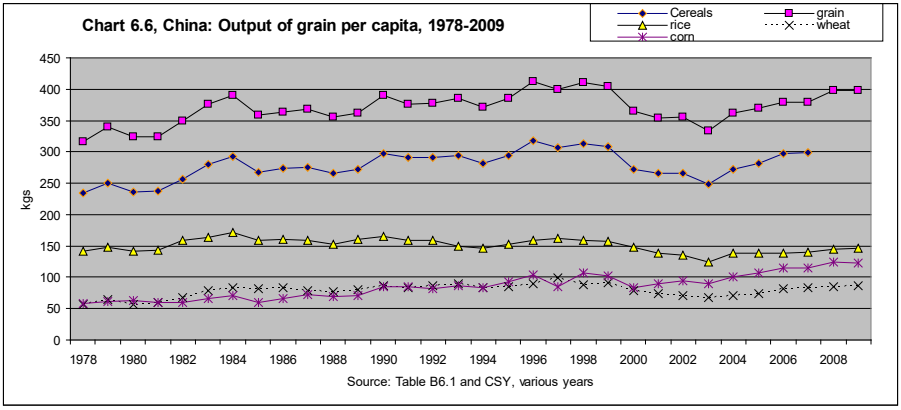


Chart 6.6 plots the per capita outputs of grains, cereals, rice, wheat and corn for 1978-2009. After attaining the highest ever output per capita in 1996, all of these except (maize) corn began to decline. Though a recovery is evident between 2003 and 2006 in the case of cereals and until 2008 for total grain, the sources of further increases are not clear. The data in the chart relates to only output or production. As shown in Chapter 4, production values per capita are higher than what ultimately becomes available for consumption. Further, changes in the composition of food demanded (consumed) effectively alters the composition of food produced, due to changes in the distribution of income - via changes in income elasticities for different foods – and a complex process of adjustment takes place, altering the availability of food for different income groups. In the next chapter, the issue of food availability is taken up in greater detail in this context. The section below discusses, the transformation in the process of rural industrialization that had taken off in pre-reform China.

6.4 POST-REFORM INDUSTRIALIZATION AND RURAL TRANSFORMATION

Industrialization of rural China had taken off in the 1970s mainly with the objectives of supporting agriculture through the supply of modern inputs as well as creating employment for the seasonally under-employed labour. This strategy of moving

industry into the rural hinterland instead of following the conventional historical pattern of urban-based industrialisation, where displaced labour from rural agrarian sectors moves into modern machine dominated urban industry, was by itself unique but one that emerged out of the specific conditions in China. Rural reforms in the late-1970s, embodied a broad perspective for the rural economy as a whole - the stress was on a comprehensive development of agriculture, industry and commerce. Substantial increases in procurement prices of agricultural output, together with the release of labour consequent to the introduction of HRS created favourable conditions for diversification in the rural economy. The basic direction of the reforms was towards a progressive decentralisation of authority and responsibility and this gave rise to newer forms of organisations in agriculture, industry as well as commerce. In the sequence of official reform policy changes, individuals were permitted to establish small businesses and trade in animal, vegetables and other minor products and also light manufactures like textiles and clothing in 1981.

Correspondingly, with the removal of many items from the government procurement list in 1982, periodic markets began to grow rapidly in numbers and in volume of goods traded. The number of rural markets expanded from 33,302 in 1978 to over 67,000 by 1993 and the volume of trade in rural markets (in deflated value terms) grew at an average rate of 12 per cent p.a. (Watson, 1988; Sicular, 1995).[14] By the end of 1992, a national wholesale market for grain trading was established along with several more at the regional levels. A futures market too was set up in Zhengzhou in March 1993 (Cheng and Tsang, 1994). It has been argued that the Chinese economy was already highly decentralised by the early 1970s and that the origins of the post-reform transformation in rural China lay in both this inherited decentralised structure as well as the broad based agricultural mechanization since the early 1970s (Naughton, 1988; Wong, 1988). These and other issues related to rural industrialization are treated below, following a discussion of the broad quantitative trends in non-agricultural rural output and employment.

6.4a Employment and Value Added in Rural Industry

The periodisation of rural industrial growth follows broad changes in policy reform. The first phase of reforms - 1978-84 – is followed by the period that ends in 1993 with the opening up to large foreign direct investment flows in 1994. Detailed data on the rural industry is available only up to 2006 (2003 is the last year for which data was published in the *China Statistical Yearbook 2004*) as by 2005 much of this sector

14 The average number of people per market in rural areas fell from 24,000 in 1990 to 15,000 in 1993 (Sicular, 1995: 1026, 1027). The number of urban 'free' markets in 1985 was 8013 compared to none in 1978.

was dominated by the private sector. By 2005 the collective and publicly owned rural enterprises could either not compete or could not be sustained and were transformed into other ownership forms (largely privatization) similar to many of the state-owned enterprises in the urban sector. The discussion below therefore examines the period 1978-2006 (employment data on the Town and Village Enterprises (TVEs) however, is available until 2009). It must be clarified here that the term TVE is used in this section to mean rural industry as a whole even though originally it denoted only the collective rural enterprises either directly or indirectly under the control of the local governments (either town or township or village). The institutional evolution of TVEs is discussed in section 6.4b below.

Table 6.4a presents the trend of annual growth rates of the various sectors of rural industry for the three periods mentioned above. Between 1978 and 1984, gross value of TVE industrial output at current prices grew at an average rate of 17 per cent p.a.[15] But rural tertiary sector grew fastest at 26 per cent p.a. due to an explosion in commercial trading (almost 28 per cent p.a.) followed by the secondary sector (16.4 per cent) while value added in the primary sector was just 6.6 per cent. In the second period, 1985-93, almost all sectors within rural industry, grew at even higher rates. The rapid expansion of sidelines (animal husbandry and fisheries besides others such as silk production and other traditional handicraft sector) during this period (discussed in the previous section) translated into an annual growth rate of nearly 21 per cent for the primary sector of rural industry. TVE Manufacturing (industry) grew at almost 28 per cent p.a. while tertiary sector maintained its pace of growth at 25.3 per cent. Within the tertiary sector, transport (including storage and communication) expanded most, growing at the highest rate for any sector at 28.5 per cent.

Table 6.4a: Growth of Value-added and Employment in TVEs, by Sector, 1978-2004 (Current Prices)

Value Added (Rate of Growth)				
	1978-84	**1985-1993**	**1994-2006**	**1985-2006**
Total	17.0	26.8	12.3	21.1
Primary	6.6	20.7	7.6	19.2
Secondary	16.4	27.3	11.7	20.5
Industry	15.2	27.9	11.9	20.8

15 Official data for the period 1978-84 relates only to brigade and commune run industries. With the formal dismantling of the communes by the mid-1980s these were re-christened as Township and Village Enterprises. Data until 1984 therefore excludes private commercial establishments. It has been observed by Young and Gang (1994) that in many cases, large private enterprises are registered as TVEs in order to avail subsidies and evade stricter regulations applicable to private enterprises.

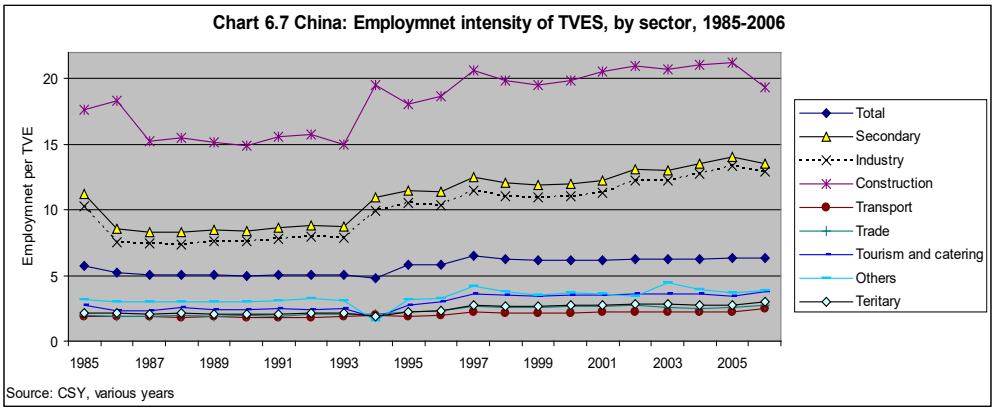
Value Added (Rate of Growth)				
	1978-84	**1985-1993**	**1994-2006**	**1985-2006**
Construction	26.0	23.2	9.3	18.0
Tertiary	26.0	25.3	15.0	23.6
Transport	16.7	28.5	11.0	21.0
Trade	27.9	27.5	14.9	25.5
Tourism and catering	23.4	24.6	18.5	24.8
Others	49.0	-0.2	23.4	23.0
Employment				
	1978-84	**1985-93**	**1994-2006**	**1985-2006**
Total	4.2	5.5	1.1	3.0
Primary	-13.1	1.1	-0.8	0.3
Secondary	7.3	5.3	0.5	2.4
Industry	5.6	5.5	1.2	2.8
Construction	15.7	4.6	-3.0	0.4
Tertiary	3.5	6.6	3.0	4.8
Transport	1.9	6.5	-0.1	2.2
Trade	4.3	7.6	3.4	6.5
Tourism and catering	5.0	6.9	6.1	6.1
Others	4.0	4.7	1.3	1.7

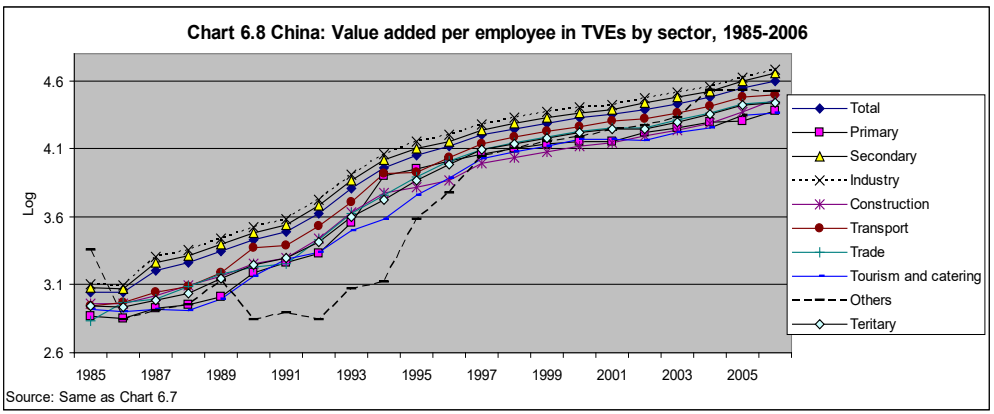
Source: Table A6.10 and A6.11

In the last phase, 1994-2006, the growth rates in almost all sectors had declined considerably, though excepting the primary and construction sectors at 7.6 per cent and 9.3 per cent p.a. respectively, they were over 11 per cent p.a for all other sub-sectors. Tertiary sector growth rate fell by over 10 percentage points to 15 per cent p.a. (relative to the period 1978-84) while in the transport sector that grew rapidly in the previous period the decline was over 16 percentage points. Overall growth during this period was 12.3 per cent p.a.

The growth in employment though significant was less impressive than value added in all the sub-periods (see Charts 6.7 & 6.8). In fact, during 1978-84, there was a net decline of 13.1 per cent in primary TVE employment and a mere 1.1 per cent p.a. growth in the following period (1985-93) which was offset by a further decline in the third period by close to 1 per cent p.a (during 1994-2006). There was a net decline in the construction sector too in the last period of 3 per cent p.a. As the Table shows, it was only during 1985-93, that employment across almost all sectors grew steadily averaging 5.5 per cent for rural industry as a whole.

The low rates of growth of employment during the entire period 1978-2006, relative to value added (at close to 5 per cent in the tertiary sector and 2.8 per cent in industry (manufacturing) and negligible for the primary sector), is partly explained by the initial levels in all these sectors.





In 1978, TVE manufacturing employment was already over 17.3 million, compared to less than 2.5 million in the tertiary sector. These numbers had grown to 85 million and 46.4 million by 2006 respectively. As a share of total TVE employment the share of manufacturing marginally fell from 61.4 per cent in 1978 to 58 per cent in 2006, while that of the tertiary sector as a whole rose from less than 9 per cent to almost 32 per cent (Table T6.4g). Clearly service industries, in particular rural service trade (13.3 per cent in 2006) absorbed a significant share of the expanding labour force. Value added manufacturing accounted for an overwhelming share of total TVE value added by 2006 at 70.5 per cent, while that of the tertiary sector was 22 per cent.

The significance of the TVE sector is greater when examined as a share of national total. Table 6.4b presents the sectoral shares of rural industry in national total for value added and employment respectively.

Rural secondary sector employment accounted for over 28.4 per cent in 1978 but by 2006, over 50 per cent of secondary employment was in the rural sector. In 1993, 1995 and 1996 this figure was over 60 per cent. As regards value added, the share of rural secondary sector rose from about 10 per cent in 1978 to 43 per cent by 2009. As a share of national GDP, TVEs were contributing close to 27 per cent compared to less than 6 per cent in 1978.

Table T6.4b: China: TVE Value Added and Employment in National Total (%), 1978–2006

TVE Value Added						
	Total	**Primary**	**Secondary**	**Industry**	**Construction**	**Tertiary**
1978-79	5.7	1.4	9.9	9.9	10.2	2.3
1980-84	7.1	1.1	12.8	12.6	15.4	4.2
1985-89	10.5	0.6	20.3	20.0	23.1	5.2
1990-94	17.8	1.2	33.6	34.1	30.5	7.9
1995-99	25.8	2.3	43.7	44.9	35.3	14.2
2000-04	26.9	2.3	45.3	46.7	34.7	14.5
2005-06	27.1	2.7	43.7	45.5	30.4	14.6
TVE Employment						
	Total	**Primary**	**Secondary**			**Tertiary**
1978-79	7.1	2.0	28.8			5.1
1980-84	7.1	1.2	30.6			4.4
1985-89	16.1	0.8	55.6			20.0
1990-94	16.3	0.7	54.6			19.1
1995-99	18.5	0.8	57.3			18.2
2000-04	18.1	0.7	56.8			18.2
2005-06	19.0	0.8	52.5			18.2

Current price data, proportions, Source: Table A6.12 & 6.13

A remarkable aspect of rural enterprise growth after 1985 has been the steady increase in exports originating in this sector. From a level of $ 2.88 billion in 1986, rural enterprise exports increased more than 7 times by 1992 to $ 21.6 billion. By 2004, this value was over $ 200 billion or 34.5 per cent of total national exports (Table 6.4c). Zweig (1991) notes that including the value of intermediate goods originating in rural enterprise that are part of other finished goods exported, would substantially increase the rural industrial share in total exports.

Table 6.4c: China: Total Value of Goods Delivered for Export by TVEs (billions of US $)

	Total	Direct Export	Chemical products	Mechanical Products	Minerals	Light Industrial Goods	Foodstuffs
1986	2.88	2.06	0.16	0.09	0.16	0.50	0.28
1987	4.54	3.20	0.22	0.06	0.21	0.42	0.40
1988	7.22	5.25	0.40	0.30	0.36	0.77	0.73
1989	9.87	7.21	0.55	0.47	0.51	1.02	0.93
1990	10.15	7.62	0.52	0.55	0.51	1.33	0.88
1991	14.82	11.12	0.65	0.76	0.53	2.68	1.01
1992	21.63	16.41	1.21	1.32	0.74	3.37	1.44
1993	38.06	24.59	1.90	2.53	1.19	7.74	2.23
1994	39.43	26.50	2.16	2.81	1.73	7.92	2.69
1995	64.60	41.57	3.55	4.60	2.83	12.97	4.41
1996	72.26	50.98	3.97	5.15	3.16	14.51	4.93
1997	82.35	65.51	4.42	6.11	3.29	17.64	5.31
1998	82.78	64.02	4.18	6.26	3.46	17.84	5.14
1999	93.54	73.95	4.66	7.68	3.37	22.70	5.67
2000	107.14	83.94	5.32	8.98	4.01	26.86	6.38
2001	115.97	94.90	5.73	9.54	4.60	29.18	6.59
2002	139.71	111.46	6.74	14.77	5.14	32.46	7.89
2003	171.52	138.81	7.65	17.24	6.78	42.17	9.26
2004	204.58	167.99	9.07	23.30	8.61	55.41	11.52

Source: China Statistical Yearbook, various years

Table 6.4d: China: Sectoral Shares in TVE Value Added, 1978-2006 (%)

	Primary	Secon Dary	Industry	Constru Ction	Tertiary	Transport	Trade	Tourism And Catering	Others
1978-79	7.4	83.2	76.7	6.6	9.4	4.5	1.9	2.1	0.9
1980-84	5.1	81.6	72.5	9.1	13.3	4.3	3.2	3.1	2.6
1985-89	1.7	83.4	72.1	11.3	15.0	5.3	4.9	3.0	1.8
1990-94	1.5	83.8	74.4	9.4	14.7	6.1	5.3	2.9	0.5
1995-99	1.7	79.2	71.1	8.2	19.1	6.1	8.3	3.7	1.0
2000-04	1.2	76.9	69.8	7.0	21.9	5.7	9.6	5.1	1.6
2005-06	1.1	76.9	70.5	6.4	21.9	5.1	9.5	5.6	1.8

Table T6.4f: China: Sectoral Shares in Total TVE Employment, 1978-2006 (%)

	Primary	Secon Dary	Industry	Constr Uction	Tertiary	Transport	Trade	Tourism and Catering	Others
1978-79	19.9	71.2	61.9	9.3	8.9	3.8	1.9	2.1	1.1
1980-84	11.2	80.1	66.3	13.8	8.7	3.6	2.0	2.1	1.0
1985-89	2.9	75.1	59.7	15.4	22.0	7.2	7.2	5.2	2.5
1990-94	2.4	73.8	59.4	14.4	23.8	7.3	8.5	5.6	2.4
1995-99	2.2	72.1	58.4	13.6	25.7	7.3	10.9	5.9	1.6
2000-04	1.8	69.3	58.2	11.1	28.9	6.5	12.4	8.0	1.9
2005-06	1.9	67.7	58.6	9.1	30.4	6.2	12.9	9.3	2.0

Source: Tables A6.10 & A6.11

The character of industrial development in post-reform China has been more significantly rural than urban, both in terms of added value as well as employment. (It must be noted here that several small rural towns and counties that were classified as rural came under the category of urban towns once certain industrial and demographic criteria were satisfied) The introduction of reforms beginning with the Household Responsibility System (HRS), proved effective in raising economic efficiency, augmenting productivity and promoting diversification and specialization. However, some serious problems have emerged alongside high growth rates. Most significant has been the adverse effect on the functional and symbiotic relationship between rural industry and agriculture that existed in the Maoist period. More specifically, dismantling of the communes led to the closure of several farm machinery production stations and repair workshops that were built up during the 1970s. In 1991, 85,000 (7.5 per cent of the total number) brigade-run enterprises were disbanded, costing 500,000 jobs. At the commune level 20,000 enterprises were shut down, more than offsetting new additions. What emerged in that space, consisted of a modified form of collective entities along with private enterprise. In the next sub-section, the institutional aspects of rural transformation and the regional dimension of TVE growth is taken up for discussion.

6.4B Rural Enterprises: Institutional and Regional Aspects

As mentioned earlier, rural industries until 1984 were the erstwhile brigade and commune industries that were re-named Township and Village enterprises in 1985 with the dissolution of the communes. The statistical tables on value added and employment rural industries thus show a break in 1985 when all forms of rural businesses (mostly private individual or household-run enterprises) that had come into existence following reforms in 1978, were agglomerated as TVEs.

There was considerable debate on institutional issues in post-reform Chinese rural transformation until the mid-1990s.[16] This was related to the broader issues emerging in the Chinese economy as a whole, on the direction of reforms and the emerging nature of the economy - whether the state still has the means and authority to effectively intervene or whether collective institutions had any relevance in an increasingly privatized economy. The expanded role of stock exchanges, reduced levels of agricultural output procurement, relaxation of movement of labour and capital across regions, increasing number of free markets and private enterprises in the rural areas, are clearly some of the visible aspects that point towards a gradual emergence of a liberalised economy.[17]Flemming (1992) however, argued that the introduction of market institutions was primarily a means of bolstering state institutions at all levels.[18] As regards the TVEs a minor but significant issue that was debated until the mid-1990s, concerned the nature of ownership and management structures in the various forms of rural enterprises.

In the spectrum of different forms of rural enterprises at one end were the TVEs, which functioned under the control and management of the governments at the town, townships, districts or the village levels. At the other end were the officially designated 'individual enterprises', which were completely private, funded and managed by individuals or households. In between these, two other forms of enterprises namely 'private enterprises' and the joint or co-operative enterprises emerged as important participants in the ongoing process of rural enterprises.[19]

16 According to Lin (1995) reforms (introduction of market institutions) led to a situation of institutional disequilibrium. He then proposes the induced institutional innovation hypothesis, which postulates that newer forms of institutions are innovated in order to exploit profitable opportunities arising from institutional disequilibrium. Blecher (1985a) in this context argues that the responsibility systems introduced in the rural areas are neither socialist nor capitalist but a hybrid of the two.

17 There has also been a revival in the private business associations. Nevitt's (1996) survey of the broad sociological significance of these associations notes that these are in the nature of "mass organisations", closely monitored and controlled by the party.

18 Market in the reform era, according to Flemming, actually strengthened the state and further reinforced the rural-urban divide. As for the latter point, he notes that, formal barriers between the agricultural and non-agricultural resident status remain as strong as ever, despite the flow of agricultural residents into the city to fill specific functions. Of the 84.3 million urban jobs assigned (created) in the urban sector, 13.4 million (or 16 per cent) were assigned to rural residents (Taylor, 1993: 280, Table 8.3).

19 Officially individual enterprises are non-agricultural businesses with fewer than 7 employees, while private enterprises are those with greater than 7 employees owned by individuals, partners or up to 30 shareholders. As Young and Gang (1994: 25) note, " Private businesses were initially developed very quietly in rural China, entering into public, national-level discussion hardly at all until 1983-84." There were also the "..*zhuanyehu*, specialised households which were seen not as private business concerns but as 'a management level within the cooperative economy'. Some of these were in fact large enterprises, well beyond the household-scale, and the authors have come across instances of enterprises registered as *zhuanyehu* whose owners were not even part of the local collective in the first place - for example, a modern chicken-farm with over 100 employees, run by an urban resident from

In terms of output, employment and value added, the collective enterprises had a dominant share until about 1995, while private enterprises had a far higher share of the number of enterprises. For instance, the collectives' (or publicly controlled) share of output was 64 per cent in 1995 compared to 73 per cent in 1985. Private and individual-owned enterprises comprised 87 per cent of the number of enterprises in 1985 and employed 39.5 per cent of total rural enterprise employment. By 1995 these shares were 93 per cent and 53 per cent respectively.

It has been extensively documented that TVEs (collective and publicly owned) were definitely not private firms (Byrd and Lin, 1990; Oi, 1992; Nee,1992). Weitzman and Xu (1994) describe TVEs as being at best vaguely defined co-operatives - essentially communal organisations, quite far removed from a well-defined ownership structure and therefore posing analytical difficulties as regards traditional property rights theory[20]. Chang and Wang (1994) concluded that in terms of control and management of TVEs, local governments were supreme and that TVEs represented a completely unique form in comparison to four other types of firms namely (i) producer co-operatives, (ii) state owned enterprises, (iii) Japanese (J) firms and (iv) large American corporations. More significantly, within the category of the non-collective sector was the individually owned (or household-owned) enterprise that dominated all four indicators – number of enterprises, employment, value added and operating income – presented in Table 6.4i.

An important development following large increases in procurement prices of agricultural products in the 1980s (with an estimated 46.3 billion Yuan infusion between 1979-81) led to considerable increases in disposable surpluses for the rural household. While a large proportion of this was deposited as savings in rural credit co-operatives, a significant quantum was channeled into private lending. The growth of a rural private economy entailed the emergence of an informal rural private financial sector. Though official data on rural private credit institutions is rather limited, micro studies have revealed the growing significance of rural informal credit and its role in rural industrialisation.[21]Feder et al (1993) conclude that by the early 1990s, there was already in existence a significantly segmented rural credit market comprising informal and formal institutions that were extensively funding the growth of rural enterprises (See also Feder et al, 1992).

Chengdu who moved out to rent land from a village for this purpose." Special regulations to cover these private enterprises came into force only in 1984.

20 According to Li (1996) the regime of property rights is ambiguous and this is due to imperfect market environment. He however concedes that ambiguous property rights have been more effective than unambiguously defined property rights.

21 See for e.g. in Feder et al (1989, 1993).

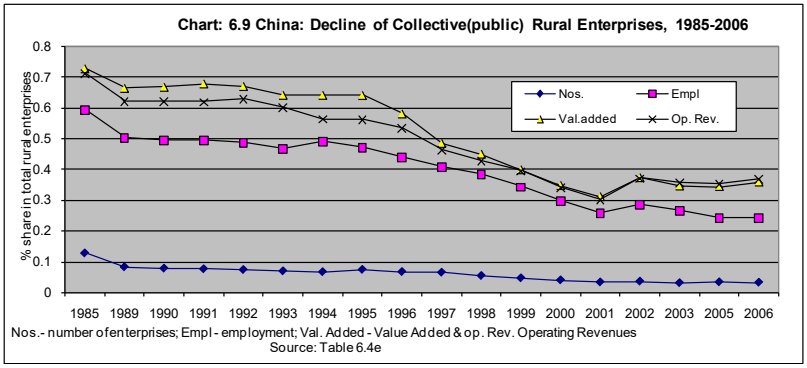
In terms of funding sources and characteristics, four typical models emerged since the mid-1980s. The best known of these is the *Wenzhou* model, which was unique in tapping local informal credit markets for expansion of its scale of operations[22]. Traditional banks and many types of local credit unions were the main source of funds, especially from the mid-1980s onwards when large joint-stock companies emerged. Shares were usually bought by a large number of households but township governments also invested in many of these companies. In 1988 there were 22, 833 joint-stock enterprises (57 per cent of total enterprises) in Wenzhou city alone. The *Susan* model (from Wuxi in south Jiangsu) represented the most common form where rural enterprises emerged out of the commune and brigade enterprises. The initial funds came from agricultural surplus from the collectives. By maintaining wages at par with agricultural wages, rapid accumulation was possible. These enterprises demonstrate the effective generation of internal capital.

The *Jinjiang* model was characterised by a high level of foreign investment and therefore found in most of the coastal provinces, which due to their locational advantages were successful in tapping funds from overseas Chinese investors from Hong Kong. In this case, shares were either sold to foreign (mainly overseas Chinese) investors or foreign funds were directly invested. Finally, there emerged also a *Suburban* model, representing what was clearly an extension of urban investment into fringe areas in order to exploit lower labour and other costs - in other words, transfer of production to rural areas. Here urban enterprises, contract with rural enterprises for either intermediate goods or even final output. In many cases, these resulted in joint enterprises between the urban sector and rural residents.

Despite the diversity and vibrancy that rural industries displayed until the mid 2000s, the most significant aspect was the gradual demise of collective and public control since the mid 1990s. Chart 6.9 and Table 6.4e clearly demonstrate this trend. Collective enterprises account for just 3 per cent of the number of enterprises but employ 24 per cent of rural industrial employment, though generating 36 per cent of value added. Kung and Min (2007) examined the paradox of markets developing in rural China initially under predominant public ownership but public ownership declined with the development of markets. The argument is that the growth of collective enterprises was driven by expanding sales, without attending to revenue generation. Though, these enterprises intensely competed with the private rural

22 Wenzhou is a district in the southeastern province of Zhejiang and came to attract nation-wide attention for the impressive performance of rural enterprises. Nolan and Fureng (1990) have compiled various aspects of the debate that ensued in China over the Wenzhou model and its applicability to other regions. In many ways it resembles the "Dazhai (Tachai) brigade" lessons that were officially prescribed for the other regions of China during the Mao period.

sector, their advantage was the access to large quantum of funds from public banks and local government. However, this advantage could not be sustained beyond a point leading to their decline.



A final point regarding the rise to dominance of the private economy in rural China concerns the share of the category recorded as 'individual' (or household). This share in the total number of enterprises was overwhelming throughout the period 1978-2006 – 83 per cent in 1985 and 76 per cent in 2006. The share in total rural industrial employment increased only marginally from 34 per cent to 38 per cent, while in value added, the shares were 21 per cent and 29 per cent in the respective years. This has been interpreted as the emergence of a large entrepreneurial class in rural China. While this may be partly true, the numbers perhaps reflect also the limits of employment absorption in rural enterprises given the intense competition for resources and finance, thereby reducing a significant proportion of rural individuals and households to seek income generation through small businesses mostly in local trading and other services. The predominance of trade in the sectoral break-up of rural industry discussed earlier lends support to this hypothesis, but only detailed data on size in terms of capital structure, employment and revenues of this category over time, can verify the same.

Table 6.4e: Composition of TVEs by Ownership Forms, 1985-2006 (proportions)

	Share in Number of Enterprises			Employment Share		
	Public	**Private**	**Individual***	**Public**	**Private**	**Individual**
1985	0.128	0.044	0.828	0.595	0.068	0.337
1989	0.082	0.057	0.861	0.504	0.094	0.402

	Share in Number of Enterprises			Employment Share		
	Public	**Private**	**Individual***	**Public**	**Private**	**Individual**
1990	0.078	0.052	0.870	0.496	0.088	0.416
1991	0.076	0.044	0.880	0.496	0.076	0.428
1992	0.073	0.043	0.884	0.487	0.073	0.440
1993	0.069	0.042	0.889	0.467	0.074	0.459
1994	0.066	0.032	0.903	0.491	0.061	0.448
1995	0.074	0.044	0.883	0.471	0.068	0.461
1996	0.066	0.097	0.837	0.441	0.182	0.377
1997	0.064	0.116	0.820	0.408	0.201	0.391
1998	0.053	0.111	0.836	0.385	0.209	0.406
1999	0.045	0.100	0.854	0.344	0.224	0.432
2000	0.038	0.099	0.863	0.299	0.254	0.447
2001	0.032	0.095	0.874	0.258	0.282	0.460
2002	0.034	0.108	0.858	0.286	0.264	0.450
2003	0.029	0.116	0.852	0.266	0.285	0.449
2005	0.032	0.206	0.762	0.242	0.348	0.410
2006	0.031	0.213	0.756	0.242	0.374	0.384
	Value added shares			**Operating Revenue shares**		
	Public	**Private**	**individual**	**Public**	**Private**	**individual**
1985	0.729	0.059	0.213	0.712	0.059	0.229
1989	0.664	0.091	0.245	0.621	0.080	0.299
1990	0.668	0.079	0.253	0.620	0.076	0.304
1991	0.679	0.068	0.253	0.619	0.065	0.315
1992	0.671	0.068	0.261	0.630	0.072	0.298
1993	0.642	0.059	0.300	0.602	0.067	0.332
1994	0.642	0.059	0.300	0.564	0.072	0.364
1995	0.641	0.059	0.300	0.561	0.074	0.365
1996	0.581	0.168	0.251	0.536	0.168	0.296
1997	0.485	0.218	0.297	0.464	0.212	0.324
1998	0.449	0.218	0.332	0.428	0.211	0.360
1999	0.398	0.241	0.360	0.395	0.241	0.365
2000	0.347	0.274	0.379	0.342	0.263	0.395
2001	0.311	0.305	0.385	0.302	0.298	0.400
2002	0.373	0.272	0.355	0.371	0.281	0.348
2003	0.345	0.304	0.351	0.356	0.297	0.347
2005	0.344	0.351	0.305	0.354	0.343	0.303
2006	0.358	0.354	0.287	0.368	0.346	0.286

Public includes existing collective and those transformed into other types of ownership forms but not private; individual includes the category others which are either household owned or small enterprises with employee numbers below a prescribed minimum eligible to be categorized as private.
Source: China Statistical Yearbook, various years

The regional spread of rural industrial development and growth has been considerably uneven. A significant proportion of rural enterprise output value is accounted for by the coastal and northeastern provinces – which also account for a

larger share of FDI. The share of eastern coastal and northeastern provinces (ECNE), which was 65.3 per cent in 1987 rose to 66.6 per cent in 1991 and further to 69.5 per cent in 2004, whereas the share of the central and western (CW) provinces together was only 34.7 per cent, falling to 33.4 per cent and further to 30.6 per cent in the respective years.[23] This trend continued up to 2006, with the share of ECNE provinces rising to 71.4 %. In 2004 and 2006, employment in ECNE provinces was 53 per cent of total rural employment with the rest in CW provinces. This represented only a minor increase from 52.8 per cent in 1988. In terms of rural enterprise, disposable income (or operating income or surplus) the share of ECNE increased from 70.6 per cent in 1987 to 74.6 per cent in 1991 but fell to 69.32 per cent in 2004 and rose again in 2006 to over 71 per cent. Corresponding shares of the decrease in CW provinces were 29.4 per cent, 25.4 per cent, 30.68 per cent and 29 per cent in the respective years.[24] Watson and Wu (1994) in their study of regional variations in rural enterprise growth note that initial endowments in terms of infrastructure and locational factors explain much of the variations. Also the share of the ECNE provinces in total rural manufacturing output value in 1988 was 74 per cent compared to 51.8 per cent in 2004.[25] In the share of TVE exports too, ECNE increased its share from 85 per cent in 1985 to almost 90 per cent by 1991 (Chen Chunlai et al 1994:18). The export share of ECNE provinces in 2004 was 88.5 per cent of total rural exports.

The regional bias in rural industrial growth in the post-1978 period is only one aspect of regional disparity that emerged in China. Though it cannot be denied that a major transformation through rapid industrialization was achieved in rural China in the past three decades (from a not so insignificant level prior to that), there have arisen equally formidable challenges that have the potential to undermine the success due to reasons of unsustainability. Since the mid-1990s, growth has slowed down considerably across the rural economy and as seen from the trends in agricultural production, further increases are necessary to sustain current levels of consumption. The decline (or even demise) of collective institutions has also meant the non-availability of the "institutional hedge". The dependence on external demand for growth has exposed China to the risks and uncertainties that are still unfolding in the industrialized countries. But within China, the worsening of personal income distribution, of widening urban-rural income differentials besides increases in intra-regional and intra-provincial rural income disparities pose serious threats in the social sphere and these are briefly taken up for discussion below.

23 The eastern and coastal provinces include Guanxi, Guangdong, Fujian, Zhejiang, Jiangsu, Shandong, Hebei, and the municipalities of Shanghai, Beijing and Tianjin. The three northeastern provinces are Liaoning, Jilin and Heilongjiang. The figures for 1987 and 1991 are from Watson and Wu (1994: 75) Table 4.1 while that for 2003 is estimated from He (2006: 418-19) Table 12, Appendix.

24 The data for 2006 on regional shares is from OECD (2009: 85) Table 1.A1.6.

25 Watson &Wu (1994), and He (2006).

6.5 POST-REFORM PROBLEMS IN RURAL CHINA

There is a dominant view that China's economic success in the 1980s and the 1990s is largely, if not wholly, due to the 'radical' policy changes in the direction of economic liberalisation and 'opening up' (in contrast to the closed nature of the economy during the previous period). According to this view, reforms had not altered the fundamental structure of the economy (the predominance of state industry, for instance) and that the gradualist path of reform does not offer much scope for improving macroeconomic efficiency. The prescription according to its adherents was to hasten reform, in a 'big-bang' fashion and widen the process of liberalisation. It is further argued that failure to do so would seriously affect efficiency in resource allocation and therefore subvert economic growth. In terms of economic growth and employment generation, the Chinese experience has performed contrary to these predictions[26] at least until the mid-1990s. However, privatisation of the rural economy post-1995 was rapid as well as quantitatively overwhelming, conforming to the prescription of liberalization.

The other view attributes the rapid growth of the economy as a whole and the rural sector in particular, to the strong foundations laid in the two decades and a half prior to reforms. In other words, the basis for the post-reform economic success lay in the broad based infrastructure both in industry and agriculture established in the first period and that reforms only acted as a catalyst in accelerating growth. The scale and speed of expansion of the rural industrial sector in post-reform China was clearly owing to a well-established structure of governance and administration that was inherited from the earlier period, though modified according to emerging circumstances. This view also attributes the problems that have emerged in agriculture, especially grain production in the second half of the 1980s until the early 1990s, to the abandonment of the collective mechanisms of the previous period.

China's experience shows that high growth rates under strategies of privatization in a hitherto socialist economy are compatible with and indeed logically entail the re-emergence of two major problems already plaguing large developing countries like

26 A related view that limits itself to reforms in former socialist economies in transition downplays the Chinese post-1978 reform experience despite its better performance in comparison to other the socialist transition economies. Kornai is perhaps the foremost representative of this viewpoint. Following a visit to China in the mid-1980s, Kornai and Daniel (1986: 300-01) noted: "[T]he dramatic and drastic closing down of the Maoist period and the launching of the reform released hidden energies, [which] enabled a suddenly accelerated growth. True, but this acceleration was a unique and non-recurring event. The high growth rate cannot be made permanent and, if it is attempted, it may lead to the well known disastrous consequences of overtaut*(sic)* plans. It is remarkable that, after the Maoist era had forced the 'big leap' and failed, the reform policy breaking away from Maoism now again attempts a 'big leap'. It seems that the temptation of organising 'big leaps' is rooted in the deepest layers of the system, which the reform has left untouched."

India, viz, food security for the poor and unemployment (Natrajan& Patnaik (2000) and Patnaik (2001). The issue of food security is taken up for detailed discussion in chapter seven.

Trends in agricultural production and in particular grain production as discussed earlier, continued to display declining growth rates from the mid 1990s. The expansion in irrigated areas since the 1990s was relatively much slower than during the pre-reform period. Water control and conservancy is an area that not only has immense scope, but is also necessary to enable future growth in agriculture. As noted earlier, areas affected by drought dominate weather-induced uncertainty, particularly in Northern China, which accounts for 44 per cent of population and 65 per cent of agricultural area, but only 14 per cent of water resources (OECD, 2009)[27]. Besides environmental problems of water pollution emanate both from within the agricultural sector due to increasing content of chemical fertilizers and pesticides as well as from rural industrialization in the southern provinces. There is also a serious problem concerning soil erosion that affected over 130 million ha in 1990, 183 million ha in 1997 and 356 million ha in 2003. Less than 40 per cent of these areas have been brought under control. These together constitute the fundamental problem in agriculture and there are clear risks of declines in future food availability.

The other major concern relates to the widening inter as well as intra-regional and rural-urban income disparities brought about by fundamental institutional changes that benefited coastal provinces more than the central and western regions. The concentration of rural industry and high growth rates of output in that sector in the eastern and coastal provinces was discussed in the previous section. With a higher rate of growth of rural industry in the eastern region compared to the western and central regions, growth of income in the former was relatively higher. In 1978, rural labour in the eastern provinces on the average were earning 25 per cent higher incomes than their counterparts in the central region and 26 per cent more than those in the western region. By 1992 these figures were respectively 89 per cent and 62 per cent. As Lin et al (2002:87) note, "[t]hese are only regional averages; in a comparison between developed and poorer provinces the gap would be more striking. For instance, in 1993, the annual per capita rural income in Sichuan province was only 19.7 per cent of that in Beijing, 16.2 per cent of Shanghai and 15 per cent of Guangdong". Rozelle (1994:385) from his study of emerging inequalities associated with rural industrialisation concluded that the biggest source of inequality was regional in nature due to the existence of barriers to the movement of outputs, inputs and information.[28] As noted in the previous chapter, rural household incomes in all

27 OECD (2009: 26) further notes that the annual shortage of water in agriculture is estimated at 30 billion cubic metres or 5/6ths of total deficit of water.

28 In this regard, Lyons (1991) concluded that policies, which discourage inter-regional trade and factor

the southern and Eastern coastal provinces, excepting Anhui, and the northeastern provinces, were higher than the national average and increasing over the period (Table 5.3f in the previous chapter). The levels in the latter group however, were at the most 18 per cent higher than the national average whereas among the coastal provinces the levels in Zhejiang were almost double the national average. The western and southwestern provinces on average had levels that were the lowest, while the central provinces formed the middle level group. The rankings over time do not seem to have changed significantly between 1990 and 2009. Further, household incomes in most of the western provinces (excluding Xinjiang) have grown more slowly than the national average. The launching of the Western region development strategy towards the end of the 1990s has not been very effective in raising incomes on par with the overall growth rate.

Table 6.5a: China: Provincial Average Rural Per Capita Net Incomes*, Yuan

	1981-84	1985-88	1989-92	1993-96	1997-00	2001-04
Guizhou	412	483	442	524	614	694
Qinghai	456	582	517	518	615	725
Shaanxi	420	484	485	481	604	732
Gansu	367	434	417	459	636	765
Yunnan	461	525	529	529	648	780
Sichuan	487	540	545	574	777	867
Ningxia	471	572	565	559	785	915
Shanxi	478	549	550	599	821	986
Anhui	529	610	494	628	854	988
Guangxi	498	508	605	708	945	1019
Inner Mongolia	545	607	619	702	930	1027
Hunan	602	680	625	692	922	1084
Hubei	554	653	607	682	939	1094
Jiangxi	536	619	649	776	973	1103
Henan	446	507	505	640	935	1129
Heilongjiang	632	691	701	887	1032	1194
Jilin	772	741	709	836	1071	1219
China	539	661	676	835	1081	1274
Hebei	485	621	606	778	1129	1316
Liaoning	769	846	813	906	1116	1327
Shandong	588	701	686	845	1126	1377
Fujian	604	718	787	1038	1429	1735
Jiangsu	671	910	887	1131	1522	1865
Guangdong	839	956	1067	1408	1789	2026
Zhejiang	748	1022	1114	1379	1675	2220

Note: * The data is adjusted by provincial consumer price indices with 1980 as the base year. The provinces are arranged in ascending order according to the 2001-04 average

Source: Natrajan (2006)

flows may be inhibiting the progress of poorer regions.

As regards urban-rural disparities in income and consumption, the movement in the ratio of urban to rural was in favor of rural households in the first phase of reforms. In the previous chapter (Tables 5.3d and 5.3e) it was noted that per capita urban household disposable income (net of taxes) was 2.6 times the corresponding rural level in 1978 but fell to 1.8 by 1985, owing to faster growth in rural incomes compared to urban in the first phase of reforms.[29] This figure rose to 2.1 during 1996-98, but increased to 2.8 by 2003 and was even higher at 3.0 during 2007-09.

The movement in the ratio of urban and rural consumption expenditure in the post-1978 period was similar. Per capita urban consumption expenditure was 2.9 times the rural levels in 1978, but fell to 2.2 times between 1983 and 1985. With the slowdown in growth after the mid eighties, combined with uneven regional growth of rural industrialization, this figure rose to 3.8 by 1995.[30] This ratio has stayed consistently above 3.6 since 1999.

According to an estimate by a Chinese scholar, the subsidy to urban consumers on every kilogram of grain alone rose from 0.2 Yuan in 1980 to 0.6 Yuan in 1988, a third of this burden fell on the peasant. In 1984, the total subsidy for urban residents on grain consumption amounted to Yuan 30 billion, which implied a subsidy per capita of Yuan 150. This latter figure is equivalent to more than a third of average rural per capita income in that year. Qinfang (1995) notes that if subsidies to urban residents in the form of lower food prices are added to their incomes and the extra burden and responsibilities on the peasants are taken into consideration, the ratio could well be 4:1.[31]

A serious phenomenon that emerged as a consequence of these forms of inequalities was the movement of large populations from one region or sector to another. This was

29 Rawski's (1982a: 17) conservative estimate for the 1978 urban-rural per capita income ratio was a minimum of 3.4 to 1, which rose to 5.9 to 1 when urban food subsidies are included. Rawski further notes that, "[I]f anything these figures underestimate the urban-rural gap because participation rates in the cities may be as high as 0.6 rather than 0.5, private plot income may have averaged less than 40 yuan per person and the estimated cash value of urban subsidies may omit pension rights or other benefits that are difficult to quantify".

30 A 1995 SSB report noted that while the average rural consumption standards did improve considerably in the 1980s, spending disparities between the richer and poorer rural households widened drastically. For instance the 1993 per capita income in real terms of the poorest 1/3rd of rural residents was below the previous year's average. Also as a proportion of national resident consumption, rural spending that accounted for 65 per cent in 1985 fell to 53 per cent by 1993. Per capita spending on housing by farmers in 1993 was 5.6 times the amount in 1985, with an average living area for each household of 20 sq.m, 70 per cent of which was of durable material - brick, wood or concrete. The same report also noted the disparities in income growth of rural and urban residents - while urban incomes tripled, rural incomes increased by 160 per cent during the decade before 1994 (*China Daily* 19 September 1995, p4)

31 (Wu Shuo, 1988 quoted by Yao, 1994: 141).

made possible due to non-enforcement of strict residency registration requirements, but also largely due to concentration of growth in some regions and shortage of labour arising also from large scale development of towns and townships that became centres of growing investment in industry and commerce. In 1995 there were 55,000 towns - 6.5 times the number in 1978 - where 105 million of the 600 million rural population lived.[32] According to Chinese sources, the estimated number of people who can be classified as the 'floating population' - people who migrate from their registered permanent place of residence in search of employment - in 1994, was between 80-120 million.

Table 6.5b: China: Provincial Growth Rates of Rural Per Capita Net Income*

	1980-2004	1985-2004	1996-2004
Qinghai	1.58	1.11	4.10
Shaanxi	2.88	1.96	5.69
Jilin	3.04	2.22	3.80
Hunan	3.15	2.52	5.61
Liaoning	3.26	2.09	4.58
Yunnan	3.28	1.76	4.99
Guizhou	3.28	2.33	3.13
Sichuan	3.33	2.81	5.64
Ningxia	3.73	2.53	6.38
Anhui	3.82	2.93	5.97
Gansu	3.90	3.12	6.82
Heilongjiang	3.92	2.83	2.77
Guangxi	4.03	4.25	4.97
Inner Mongolia	4.16	3.03	4.77
Shanxi	4.32	2.93	6.29
Hubei	4.39	2.93	5.96
Jiangxi	4.39	3.49	3.95
Guangdong	5.07	4.91	4.57
Jiangsu	5.20	4.52	5.98
Shandong	5.36	3.84	5.97
Henan	5.44	4.75	8.10
Zhejiang	5.89	4.70	5.55
Hebei	5.89	4.77	6.88
China (average)	5.89	4.15	4.47
Fujian	6.09	5.44	6.77

Net Income is equivalent to disposable income and is adjusted over time by provincial consumer price indices.

Source: same as Table 6.5d

32 *Xinhua* (24 July 1995) quoted from *Foreign Broadcast Information Service* (*FBIS*) 25 July 1995.

The same source projected then that by 2000, of the projected rural population of 490-540 million, 200 million would be migrants.[33] A recent report has estimated the floating population to be 211 million in 2010.[34]

Conforming to historical development experience and to the migration models, movement of labour has been from lower income regions to higher income ones. The rapid but uneven regional growth of TVEs was also instrumental in attracting cheap farm labour. According to another Chinese source, in 1995, 60 per cent of the labour in the 500 top TVEs, are migrant farmers. In Guangdong, 70 per cent of migrants work in TVEs, while in Wuxi (Jiangsu province) a quarter of non-agricultural labour comprise migrants and in Shenzen this figure was half.[35]

Despite embarking on a model of industrialization that was historically different during the first three decades, the same problems that market-oriented growth and development gave rise to in other countries have manifested themselves in China as well. Though it can be argued that the scale and intensity was significantly less in China, uneven regional growth, stagnation in the rural economy and dependence on the external demand for sustenance of growth, the overall iniquitous path of development are likely to pose more challenges for the Chinese state. But as reiterated earlier, the concerns with regard to food availability and consumption are likely to add to the complexity of the current situation in China and this is taken up in the next chapter.

Table A6.1: China: Gross Output Value in Agriculture by Sub-sector, 1978-2009

	Comparable 2000 Prices 100 Million Yuan					Share in Total Agriculture (Proportion)			
	Total	**Farming**	**Forestry**	**Animal Husbandry**	**Fishery**	**Farming**	**Forestry**	**Animal Husbandry**	**Fishery**
1978	6359	4831	297	1020	235	0.76	0.05	0.16	0.04
1979	6840	5157	301	1169	227	0.75	0.04	0.17	0.03
1980	6936	5142	338	1251	245	0.74	0.05	0.18	0.04

33 *Beijing Review*, July 18-24, 1994: 25. According to the Agricultural Bank of China estimates, in 1993 5.84 per cent of rural people migrated for an average period of 6.75 months giving a migrant population figure of 49 million. (Knight and Song, 1995: 114). In official publications, the words "migrants", "floating population" and "surplus labour" are often used interchangeably.

34 "Report on floating population 2011". See *China Daily*, (1 March 2011).

35 ZhongguoXinwen She (7 July 1995) translated in *FBIS* 8 July 1995, "Migrant labour makes great contributions to society". It is stated further in this news report, that " ...cheap labour force provided by farmers has supported the development of rural enterprises as well as foreign-funded enterprises. The rapid economic development in prosperous regions is clearly connected with the contribution of the labour force there provided by migrant farmers". There is also another side of the story of migrants. *Beijing Review* (July 18-24, 1994) reported that 90 per cent of migrants in Beijing and Shanghai sweep streets.

	Comparable 2000 Prices 100 Million Yuan					Share in Total Agriculture (Proportion)			
	Total	Farming	Forestry	Animal Husbandry	Fishery	Farming	Forestry	Animal Husbandry	Fishery
1981	7386	5490	352	1324	256	0.74	0.05	0.18	0.03
1982	8219	6091	382	1502	287	0.74	0.05	0.18	0.03
1983	8857	6609	421	1562	312	0.75	0.05	0.18	0.04
1984	9942	7367	502	1770	367	0.74	0.05	0.18	0.04
1985	10282	7354	524	2075	436	0.72	0.05	0.20	0.04
1986	10631	7553	505	2191	525	0.71	0.05	0.21	0.05
1987	11248	8036	504	2261	620	0.71	0.04	0.20	0.06
1988	11687	8148	515	2546	692	0.70	0.04	0.22	0.06
1989	12049	8344	517	2686	742	0.69	0.04	0.22	0.06
1990	12965	9012	533	2874	816	0.70	0.04	0.22	0.06
1991	13444	9093	576	3127	878	0.68	0.04	0.23	0.07
1992	14305	9474	621	3402	1013	0.66	0.04	0.24	0.07
1993	15420	9967	670	3769	1199	0.65	0.04	0.24	0.08
1994	16747	10286	730	4399	1439	0.61	0.04	0.26	0.09
1995	18572	11099	766	5050	1718	0.60	0.04	0.27	0.09
1996	20318	11964	810	5626	1959	0.59	0.04	0.28	0.10
1997	21679	12503	837	6194	2184	0.58	0.04	0.29	0.10
1998	22980	13115	861	6652	2376	0.57	0.04	0.29	0.10
1999	24050	13682	889	6955	2547	0.57	0.04	0.29	0.11
2000	24916	13874	937	7393	2713	0.56	0.04	0.30	0.11
2001	25962	14373	930	7856	2818	0.55	0.04	0.30	0.11
2002	27245	14934	996	8328	2991	0.55	0.04	0.31	0.11
2003	28308	15009	1064	8936	3150	0.53	0.04	0.32	0.11
2004	30418	16284	1086	9579	3340	0.54	0.04	0.31	0.11
2005	32141	16959	1120	10331	3559	0.53	0.03	0.32	0.11
2006	33882	17873	1183	10847	3772	0.53	0.03	0.32	0.11
2007	35191	18584	1264	11095	3954	0.53	0.04	0.32	0.11
2008	37206	19472	1366	11844	4190	0.52	0.04	0.32	0.11
2009	38918	20216	1464	12530	4433	0.52	0.04	0.32	0.11

Source: China Statistical Yearbook, various issues

Table A6.2: China: Arable Land and Areas Affected by Weather, 1978-2008, 1000 ha

	Cultivated Area		Annual Changes		Weather Affected Areas			Share in Cultivated Area (CSY)		
	FAO	USDA**	FAO	USDA	Total	Floods	Drought	Total	Floods	Drought
1978	100316	99390			21800	920	17970	21.9	0.9	18.1
1979	100423	99389	107	0	15120	2870	9320	15.5	3.0	9.6
1980	100219	99498	-204	109	22320	5030	12490	23.0	5.2	12.9
1981	100908	99305	689	-193	18740	3970	12130	19.2	4.1	12.4
1982	101199	99035	291	-270	16120	4460	9970	16.5	4.6	10.2
1983	114902	98606	13703	-429	16210	5750	7590	14.6	5.2	6.8

	Cultivated Area		Annual Changes		Weather Affected Areas			Share in Cultivated Area (CSY)		
	FAO	USDA**	FAO	USDA	Total	Floods	Drought	Total	Floods	Drought
1984	115900	98359	998	-247	15260	5400	7020	13.6	4.8	6.3
1985	125896	97853	9996	-506	22710	8950	10060	18.8	7.4	8.3
1986	126996	96846	1100	-1007	23660	5580	14760	19.6	4.6	12.2
1987	128794	96229	1798	-617	20390	4100	13030	16.8	3.4	10.7
1988	129703	95888	909	-341	23940	6130	15300	19.6	5.0	12.5
1989	131002	95721	1299	-167	24450	5920	15260	19.8	4.8	12.4
1990	131397	95656	395	-65	17820	5600	7810	14.4	4.5	6.3
1991	131891	95672	494	16	27810	14610	10560	22.4	11.8	8.5
1992	132383	95653	492	-19	25900	4460	17050	20.8	3.6	13.7
1993	130837	95425	-1546	-228	23130	8610	8860	19.0	7.1	7.3
1994	131274	95101	437	-324	31380	10740	17050	25.8	8.8	14.0
1995	132715	94906	1441	-195	22267	7630	10401	18.2	6.2	8.5
1996	132239	94971	-476	65	21234	10855	6247	17.5	8.9	5.1
1997	131353	130039	-886	35068	30309	5840	20012	25.2	4.9	16.7
1998	132820	129903	1467	-136	25181	13785	5060	20.7	11.3	4.2
1999	132266	129642	-554	-261	26731	5071	16614	22.1	4.2	13.7
2000	132202	129206	-64	-436	34374	4321	26784	28.4	3.6	22.1
2001	131265	128243	-937	-963	31793	3614	23698	26.5	3.0	19.7
2002	130363	127616	-902	-627	27319	7474	13247	23.0	6.3	11.1
2003	128500	125930	-1863	-1686	32516	12289	14470	27.9	10.5	12.4
2004	134416	123392	5916	-2537	16297	3747	8482	13.3	3.1	6.9
2005	130878	122444	-3538	-948	19966	6047	8479	16.9	5.1	7.2
2006	130874	122067	-4	-377	24632	4569	13411	20.8	3.9	11.3
2007	122566	121776	-8308	-291	25064	5105	16170	22.9	4.7	14.8
2008	122543	121735	-23	-60	22283	3656	6798	20.5	3.4	6.3

*As a share of USDA series; ** The USDA series is a compilation from annually reported official data.
Source: FAO, USDA (ERS)

Table A6.3: China: Total Sown Areas, Multiple Cropping Indices and Irrigated Areas 1978-2009 (1000 ha)

	Total Sown Area		Multiple Cropping Index		Irrigated Area (IA)		%Share of IA in Cultivated Area	%Share of MIA in IA
	TSA	Change	MCI-USDA	MCI-FAO	Total	Mechanical (MIA)		
1978	148477		1.49	1.48	44965	24895	45.2	55.4
1979	146379	-2097	1.47	1.46	45003	25321	45.3	56.3
1980	145157	-1222	1.46	1.45	44888	25315	45.1	56.4
1981	144755	-403	1.46	1.43	44574	25231	44.9	56.6
1982	143993	-761	1.45	1.42	44177	25145	44.6	56.9
1983	144221	228	1.46	1.26	44644	25265	45.3	56.6
1984	143626	-595	1.46	1.24	44453	25062	45.2	56.4
1985	144204	578	1.47	1.15	44036	24629	45.0	55.9
1986	144957	753	1.50	1.14	44226	25032	45.7	56.6
1987	144869	-88	1.51	1.12	44403	24825	46.1	55.9

	Total Sown Area		Multiple Cropping Index		Irrigated Area (IA)		%Share of IA in Cultivated Area	%Share of MIA in IA
	TSA	Change	MCI-USDA	MCI-FAO	Total	Mechanical (MIA)		
1988	146554	1685	1.53	1.13	44376	26083	46.3	58.8
1989	148362	1808	1.55	1.13	44917	26107	46.9	58.1
1990	149586	1224	1.56	1.14	47403	27148	49.6	57.3
1991	149007	-579	1.56	1.13	47822	27629	50.0	57.8
1992	147741	-1266	1.54	1.12	48590	28283	50.8	58.2
1993	148241	500	1.55	1.13	48728	31625	51.1	64.9
1994	149879	1639	1.58	1.14	48759	31528	51.3	64.7
1995	152381	2501	1.61	1.15	49281	32205	51.9	65.3
1996	153969	1589	1.62	1.16	50381	32891	53.0	65.3
1997	155706	1737	1.20	1.19	51239	34370	39.4	67.1
1998	156373	667	1.20	1.18	52296	34716	40.3	66.4
1999	156300	-73	1.21	1.18	53158	35639	41.0	67.0
2000	155708	-592	1.21	1.18	53820	35954	41.7	66.8
2001	154636	-1072	1.21	1.18	54249	36212	42.3	66.8
2002	152415	-2221	1.19	1.17	54355	36213	42.6	66.6
2003	153553	1138	1.22	1.19	54014	36162	42.9	66.9
2004	153553	0	1.24	1.14	54478	36055	44.2	66.2
2005	155488	1935	1.27	1.19	55029	36715	44.9	66.7
2006	152149	-3339	1.25	1.16	55750	37762	45.7	67.7
2007	153464	1315	1.26	1.25	56518	37762	46.4	66.8
2008	156266	2802	1.28	1.28	58472		48.0	
2009	158639	2374			59261			

MIA – Irrigation with mechanical power. Irrigated area as a share of Cultivated area uses the USDA series in Table 6.1c.
Source: USDA, *China Statistical Yearbook* (various years)

Table A6.4: China: Composition of Total Sown Area 1978-2009 (proportions)

	Rice	Wheat	Corn	Soybean	Tubers	Other Grain	Total Grain	Non-grain Food	Total Food	Non-Food
1978	0.232	0.197	0.134	0.048	0.079	0.122	0.812	0.091	0.903	0.097
1979	0.231	0.201	0.138	0.050	0.075	0.121	0.815	0.098	0.913	0.087
1980	0.233	0.201	0.140	0.050	0.070	0.113	0.808	0.105	0.913	0.087
1981	0.230	0.196	0.134	0.055	0.066	0.113	0.794	0.113	0.907	0.093
1982	0.230	0.194	0.129	0.058	0.065	0.112	0.788	0.121	0.909	0.091
1983	0.230	0.201	0.131	0.052	0.065	0.111	0.791	0.117	0.907	0.093
1984	0.231	0.206	0.129	0.051	0.063	0.107	0.786	0.122	0.908	0.092
1985	0.222	0.203	0.123	0.054	0.059	0.094	0.755	0.152	0.906	0.094
1986	0.223	0.204	0.132	0.057	0.060	0.089	0.765	0.156	0.922	0.078
1987	0.222	0.199	0.140	0.058	0.061	0.088	0.768	0.162	0.930	0.070

	Rice	Wheat	Corn	Soybean	Tubers	Other Grain	Total Grain	Non-grain Food	Total Food	Non-Food
1988	0.218	0.196	0.134	0.055	0.062	0.085	0.751	0.167	0.918	0.082
1989	0.220	0.201	0.137	0.054	0.061	0.082	0.756	0.167	0.923	0.077
1990	0.221	0.206	0.143	0.051	0.061	0.077	0.759	0.168	0.927	0.073
1991	0.219	0.208	0.145	0.061	0.061	0.060	0.754	0.177	0.931	0.069
1992	0.217	0.206	0.142	0.061	0.061	0.060	0.748	0.185	0.933	0.067
1993	0.205	0.204	0.140	0.083	0.062	0.051	0.745	0.192	0.938	0.062
1994	0.201	0.193	0.141	0.085	0.062	0.042	0.724	0.208	0.932	0.068
1995	0.202	0.189	0.149	0.074	0.062	0.045	0.722	0.221	0.943	0.057
1996	0.204	0.192	0.159	0.068	0.064	0.043	0.731	0.224	0.955	0.045
1997	0.204	0.193	0.153	0.072	0.063	0.041	0.725	0.227	0.952	0.048
1998	0.200	0.190	0.161	0.075	0.064	0.038	0.728	0.235	0.963	0.037
1999	0.200	0.185	0.166	0.072	0.066	0.036	0.724	0.248	0.972	0.028
2000	0.192	0.171	0.148	0.081	0.068	0.036	0.697	0.271	0.967	0.033
2001	0.186	0.159	0.157	0.086	0.066	0.031	0.686	0.277	0.963	0.037
2002	0.185	0.157	0.162	0.082	0.065	0.031	0.682	0.290	0.971	0.029
2003	0.173	0.143	0.157	0.084	0.063	0.028	0.647	0.295	0.942	0.058
2004	0.185	0.141	0.166	0.083	0.062	0.025	0.662	0.290	0.952	0.048
2005	0.186	0.147	0.170	0.083	0.061	0.025	0.671	0.289	0.960	0.040
2006	0.190	0.155	0.187	0.080	0.052	0.026	0.690	0.273	0.963	0.037
2007	0.188	0.155	0.192	0.077	0.053	0.024	0.688	0.277	0.965	0.035
2008	0.187	0.151	0.191	0.078	0.054	0.023	0.683	0.289	0.972	0.028
2009	0.187	0.153	0.197	0.075	0.054	0.021	0.687	0.296	0.983	0.017

Source: China Statistical Yearbook, various years

Table A6.5: China: Share of Grain Crops in Total Grain Sown Area and of Non-Grain Crops in Total Sown Area (proportions)

	Share of Grains in Total Grain Sown Area					Share of Non-Grain Food Crops in Tsa						
	Rice	Wheat	Corn	Soybean	Tubers	Oilcrops	Sugarcane	Vegetables	Tea	Fruit	Cotton	Tobacco
1978	0.285	0.242	0.166	0.059	0.098	0.042	0.004	0.025	0.007	0.011	0.033	0.004
1979	0.284	0.246	0.169	0.061	0.092	0.048	0.003	0.025	0.007	0.012	0.031	0.003
1980	0.289	0.249	0.174	0.062	0.087	0.055	0.003	0.025	0.007	0.012	0.034	0.003
1981	0.290	0.246	0.169	0.070	0.084	0.063	0.004	0.024	0.007	0.012	0.036	0.004
1982	0.291	0.247	0.163	0.074	0.083	0.065	0.005	0.027	0.008	0.014	0.040	0.006
1983	0.291	0.255	0.165	0.066	0.082	0.058	0.005	0.028	0.008	0.014	0.042	0.004
1984	0.294	0.262	0.164	0.065	0.080	0.060	0.005	0.030	0.007	0.015	0.048	0.005
1985	0.295	0.268	0.163	0.071	0.079	0.082	0.007	0.033	0.007	0.019	0.036	0.007
1986	0.291	0.267	0.172	0.075	0.078	0.079	0.007	0.037	0.006	0.025	0.030	0.006
1987	0.289	0.259	0.182	0.076	0.080	0.077	0.006	0.038	0.006	0.031	0.033	0.006
1988	0.290	0.261	0.179	0.074	0.082	0.072	0.006	0.041	0.007	0.035	0.038	0.009
1989	0.291	0.266	0.181	0.072	0.081	0.071	0.006	0.042	0.007	0.036	0.035	0.010
1990	0.291	0.271	0.189	0.067	0.080	0.073	0.007	0.042	0.007	0.035	0.037	0.009
1991	0.290	0.276	0.192	0.082	0.081	0.077	0.008	0.044	0.007	0.036	0.044	0.010
1992	0.290	0.276	0.190	0.081	0.082	0.078	0.008	0.048	0.007	0.039	0.046	0.013
1993	0.275	0.274	0.187	0.112	0.083	0.075	0.007	0.055	0.008	0.043	0.034	0.012
1994	0.278	0.267	0.195	0.117	0.085	0.081	0.007	0.060	0.008	0.048	0.037	0.009
1995	0.279	0.262	0.207	0.102	0.086	0.086	0.007	0.062	0.007	0.053	0.036	0.009

	Share of Grains in Total Grain Sown Area					Share of Non-Grain Food Crops in Tsa						
	Rice	Wheat	Corn	Soybean	Tubers	Oilcrops	Sugarcane	Vegetables	Tea	Fruit	Cotton	Tobacco
1996	0.279	0.263	0.218	0.094	0.087	0.082	0.008	0.068	0.007	0.056	0.031	0.011
1997	0.281	0.266	0.211	0.099	0.087	0.080	0.008	0.072	0.007	0.056	0.029	0.014
1998	0.274	0.262	0.222	0.103	0.088	0.083	0.009	0.079	0.007	0.055	0.029	0.008
1999	0.276	0.255	0.229	0.099	0.092	0.089	0.008	0.085	0.007	0.055	0.024	0.008
2000	0.276	0.246	0.213	0.117	0.097	0.099	0.008	0.098	0.007	0.057	0.026	0.008
2001	0.272	0.233	0.229	0.125	0.096	0.095	0.008	0.106	0.007	0.058	0.031	0.008
2002	0.271	0.230	0.237	0.121	0.095	0.097	0.009	0.114	0.007	0.060	0.027	0.008
2003	0.267	0.221	0.242	0.130	0.098	0.098	0.009	0.117	0.008	0.061	0.033	0.007
2004	0.279	0.213	0.250	0.126	0.093	0.094	0.009	0.114	0.008	0.064	0.037	0.007
2005	0.277	0.219	0.253	0.124	0.091	0.092	0.009	0.114	0.009	0.065	0.033	0.008
2006	0.276	0.225	0.271	0.116	0.075	0.077	0.009	0.109	0.009	0.067	0.038	0.007
2007	0.274	0.225	0.279	0.112	0.077	0.074	0.010	0.113	0.011	0.068	0.039	0.007
2008	0.274	0.221	0.280	0.113	0.079	0.082	0.011	0.114	0.011	0.069	0.037	0.008
2009	0.272	0.223	0.286	0.110	0.079	0.086	0.011	0.116	0.012	0.070	0.031	0.008

Source: China Statistical Yearbook, various years.

Table A6.6: China: Sown Areas under Various Crops, 1978-2009, 1000 ha

	TSA	TSAg	Rice	Wheat	Corn	Soy-bean	Tubers	Oil-crops	Peanuts	Rape-seed	Sugar cane	Vegeta-bles	Fruits	Flue-cured tobacco	Cottonn
1978	148477	120587	34421	29183	19961	7144	11796	6222	1768	2599	549	3737	1014	613	4867
1979	146379	119263	33873	29357	20133	7247	10952	7051	2075	2761	512	3695	1048	509	4512
1980	145157	117234	33879	29228	20353	7227	10153	7929	2339	2844	479	3606	1051	397	4920
1981	144755	114958	33295	28307	19425	8023	9621	9134	2473	3801	551	3448	1041	587	5185
1982	143993	113463	33071	27995	18543	8419	9370	9343	2416	4122	653	3888	1097	889	5829
1983	144221	114047	33137	29050	18824	7567	9402	8390	2201	3669	654	4102	1105	572	6077
1984	143626	112884	33179	29577	18537	7286	8988	8678	2421	3413	728	4320	1077	715	6923
1985	144204	108845	32070	29218	17694	7718	8572	11800	3319	4494	965	4753	1045	1077	5141
1986	144957	110933	32266	29616	19124	8295	8685	11414	3253	4916	950	5304	804	895	4306
1987	144869	111268	32193	28798	20212	8445	8867	11180	3022	5267	859	5572	809	913	4844
1988	146554	110123	31987	28785	19692	8120	9054	10619	2977	4937	924	6032	1056	1304	5535
1989	148362	112205	32701	29841	20353	8057	9097	10504	2946	4993	959	6290	1065	1503	5203
1990	149586	113466	33064	30753	21401	7559	9121	10900	2907	5503	1009	6338	1061	1342	5588
1991	149007	112314	32590	30948	21574	9163	9078	11530	2880	6133	1164	6546	1060	1562	6538
1992	147741	110560	32090	30496	21044	8983	9057	11489	2976	5976	1246	7031	1084	1849	6835
1993	148241	110509	30355	30235	20694	12377	9220	11142	3379	5300	1088	8084	1171	1835	4985
1994	149879	108544	30171	28981	21152	12736	9270	12081	3776	5783	1057	8921	1135	1302	5528
1995	152381	110060	30744	28860	22776	11232	9519	13102	3809	6907	1125	9515	1115	1309	5422
1996	153969	112548	31406	29611	24498	10543	9797	12555	3616	6734	1207	10491	1103	1683	4722
1997	155706	112912	31765	30057	23775	11164	9785	12381	3722	6475	1311	11288	1076	2161	4491
1998	156373	113787	31214	29774	25239	11671	10000	12919	4039	6527	1401	12293	1057	1200	4459
1999	156300	113161	31283	28855	25904	11190	10355	13906	4268	6899	1303	13347	1130	1216	3726
2000	155708	108463	29962	26653	23056	12660	10538	15400	4856	7494	1185	15237	1089	1269	4041
2001	154636	106080	28812	24664	24282	13268	10217	14631	4991	7095	1248	16402	1141	1181	4810
2002	152415	103891	28202	23908	24634	12543	9881	14766	4921	7143	1393	17353	1134	1192	4184
2003	153553	99410	26508	21997	24068	12899	9702	14990	5057	7221	1409	17954	1207	1139	5111
2004	153553	101606	28379	21626	25446	12799	9457	14431	4745	7271	1378	17560	1262	1145	5693
2005	155488	104278	28847	22793	26358	12901	9503	14318	4662	7278	1354	17721	1352	1245	5062
2006	152149	104958	28938	23613	28463	12149	7877	11738	3960	5984	1378	16639	1431	1088	5816
2007	153464	105638	28919	23721	29478	11780	8082	11316	3945	5642	1586	17329	1613	1066	5926
2008	156266	106793	29241	23617	29864	12118	8427	12825	4246	6594	1743	17876	1719	1230	5754
2009	158639	108986	29627	24291	31183	11949	8636	13652	4377	7278	1697	18414	1849	1265	4952

Source: China Statistical Yearbook various years, USDA

Table A6.7: China: Mechanical and Intermediate Inputs in Agriculture, 1978-2009

	Agricultural Machinery			Rural Electricity*		Chemical Fertilizer Application (in effective terms 10000 tons)					
	Total power (10000kw)	Tractors (10000)		Generating Capacity	Consum-ption	Nitrogen	Phosphate	Potash	Compound	Total	Kgs/ha
		Large & Medium	Small & Walking								
1978	11750.0	55.7	137.3	228.4	25.3					884.0	59.5
1979	13379.0	66.7	167.1	276.3	28.3	825.9	223.5	31.6		1086.3	74.2
1980	14746.0	74.5	187.4	304.1	32.1	934.2	273.3	34.6	27.2	1269.3	87.4
1981	15680.0	79.2	203.7	336.0	37.0	942.0	295.6	40.7	56.6	1334.9	92.2
1982	16614.0	81.2	228.7	353.0	39.7	1043.3	344.8	56.8	68.5	1513.4	105.1
1983	18022.0	84.1	275.0	346.3	42.8	1163.8	351.4	58.4	86.2	1659.8	115.1
1984	19497.0	85.4	329.8	361.5	46.4	1215.3	328.6	69.4	126.5	1739.8	121.1
1985	20913.0	85.2	382.4	380.2	50.9	1204.9	310.9	80.4	179.6	1775.8	123.1
1986	22950.0	86.6	452.6	387.9	58.7	1312.6	359.8	77.4	180.8	1930.6	133.2
1987	24836.0	88.1	530.0	394.1	65.9	1326.8	371.9	91.9	208.7	1999.7	138.0
1988	26575.0	87.0	595.8	428.9	71.2	1417.1	382.1	101.2	241.2	2141.5	146.1
1989	28067.0	84.8	654.3	416.8	79.1	1536.8	418.9	120.5	280.9	2357.1	158.9
1990	28707.7	81.4	698.1	428.8	84.5	1638.4	462.4	147.9	341.6	2590.3	173.2
1991	29388.6	78.4	730.4	456.9	96.3	1726.1	499.6	173.9	405.5	2805.1	188.3
1992	30308.4	75.9	750.7	478.7	110.7	1756.1	515.7	196.0	462.4	2930.2	198.3
1993	31816.6	72.1	788.3	481.9	124.5	1835.1	575.1	212.3	529.4	3151.9	212.6
1994	33802.5	69.3	823.7	503.6	147.4	1882.0	600.7	234.8	600.6	3318.1	221.4
1995	36118.1	67.2	864.6	519.5	165.6	2021.9	632.4	268.5	670.8	3593.6	235.8
1996	38546.9	67.1	918.9	533.7	181.3	2145.3	658.4	289.6	734.7	3828.0	248.6
1997	42015.6	68.9	1048.5	562.5	198.0	2171.7	689.1	322.0	798.1	3980.9	255.7
1998	45207.7	72.5	1122.1	634.8	204.2	2233.3	682.5	345.7	822.0	4083.5	261.1
1999	48996.1	78.4	1200.3	664.1	217.3	2180.9	697.8	365.6	880.0	4124.4	263.9
2000	52573.6	97.5	1264.4	698.5	242.1	2161.5	690.5	376.5	917.9	4146.3	266.3
2001	55172.1	83.0	1305.1	896.6	261.1	2164.1	705.7	399.6	983.7	4253.1	275.0
2002	57929.9	91.2	1339.4	812.2	299.3	2157.3	712.2	422.4	1040.4	4332.3	284.2
2003	60386.5	98.1	1377.7	862.3	343.3	2149.9	713.9	438.0	1109.8	4411.6	287.3
2004	64027.9	111.9	1454.9	993.8	393.3	2221.9	736.0	467.3	1204.0	4629.1	301.5
2005	68397.8	139.6	1526.9	1099.2	437.6	2229.3	743.8	489.5	1303.2	4765.8	306.5
2006	72522.1	171.8	1567.9	1243.0	489.6	2262.5	769.5	509.7	1385.9	4927.7	323.9
2007	76589.6	206.3	1619.1	1366.6	551.0	2297.2	773.0	533.6	1503.0	5107.8	332.8
2008	82190.4	299.5	1722.4	5127.4	571.3	2302.9	780.1	545.2	1608.6	5239.0	335.3
2009	87496.1	351.6	1750.9	5512.1	610.4	2329.9	797.7	564.3	1698.7	5404.4	340.7

* Generating capacity is in 10000 kws and consumption is in billions of kwhs.
Source: China Statistical Yearbook, various years & UDSA

Table A6.8: China: Production of Various Agricultural Products, 1978-2009, 10000 Tons (...continues)

	Grain	Cereals*	Rice	Wheat	Corn	Soybean	Tubers	Oilcrops	Peanuts	Rapeseed
1978	30477	22641	13693	5384	5595	757	3174	522	238	187
1979	33212	24383	14375	6273	6004	746	2846	644	282	240
1980	32056	23271	13991	5521	6260	794	2873	769	360	238
1981	32502	23751	14396	5964	5921	933	2597	1021	383	407
1982	35450	26051	16160	6847	6056	903	2705	1182	392	566
1983	38728	28835	16887	8139	6821	976	2925	1055	395	429
1984	40731	30563	17826	8782	7341	970	2848	1191	482	421
1985	37911	28283	16857	8581	6383	1050	2604	1578	666	561
1986	39151	29390	17222	9004	7086	1161	2534	1474	588	588
1987	40298	30041	17426	8590	7924	1247	2820	1528	617	661

	Grain	Cereals*	Rice	Wheat	Corn	Soybean	Tubers	Oilcrops	Peanuts	Rapeseed
1988	39408	29473	16911	8543	7736	1165	2697	1320	569	504
1989	40755	30687	18013	9081	7893	1023	2730	1295	536	544
1990	44624	34061	18933	9823	9682	1100	2743	1613	637	696
1991	43529	33663	18381	9595	9877	1247	2716	1638	630	744
1992	44266	34157	18622	10160	9538	1252	2844	1641	595	765
1993	45649	34807	17751	10639	10270	1950	3181	1804	842	694
1994	44510	33719	17593	9930	9928	2096	3025	1990	968	749
1995	46662	35629	18523	10221	11199	1788	3263	2250	1023	978
1996	50454	38805	19510	11057	12747	1790	3536	2211	1014	920
1997	49417	37841	20073	12329	10431	1876	3192	2157	965	958
1998	51230	39161	19871	10973	13295	2001	3604	2314	1189	830
1999	50839	38846	19849	11388	12809	1894	3641	2601	1264	1013
2000	46218	34413	18791	9964	10600	2010	3685	2955	1444	1138
2001	45264	33869	17758	9387	11409	2053	3563	2865	1442	1133
2002	45706	34128	17454	9029	12131	2241	3666	2897	1482	1055
2003	43070	32208	16066	8649	11583	2128	3513	2811	1342	1142
2004	46947	35305	17909	9195	13029	2232	3558	3066	1434	1318
2005	48402	36875	18059	9745	13937	2158	3469	3077	1434	1305
2006	49804	39176	18257	10847	15160	2004	2701	2640	1289	1097
2007	50160	39529	18603	10930	15230	1720	2808	2569	1303	1057
2008	52871		19190	11246	16591	2043	2980	2953	1429	1210
2009	53082		19510	11512	16397	1930	2995	3154	1471	1366

* Data from FAO, Source data: *China Statistical Yearbook*, various issues

Table A6.8: (continued) China: Production of Various Agricultural Products, 1978-2009, 10000 Tons

	Seasame	Sugarcane	Beetroot	Fruit	Cotton	Tobacco	Tea
1978	32	2112	270	657	217	124	27
1979	42	2151	311	702	221	94	28
1980	26	2281	631	679	271	85	30
1981	51	2967	636	780	297	150	34
1982	34	3688	671	771	360	218	40
1983	35	3114	918	949	464	138	40
1984	48	3952	828	985	626	179	41
1985	69	5155	892	1164	415	243	43
1986	62	5022	831	1348	354	171	46
1987	53	4736	814	1668	425	194	51
1988	40	4906	1281	1666	415	273	55
1989	34	4880	924	1832	379	283	54
1990	47	5762	1453	1874	451	263	54
1991	44	6790	1629	2176	568	303	54
1992	52	7301	1507	2440	451	350	56

	Seasame	Sugarcane	Beetroot	Fruit	Cotton	Tobacco	Tea
1993	56	6419	1205	3011	374	345	60
1994	55	6093	1253	3500	434	224	59
1995	58	6542	1398	4215	477	231	59
1996	58	6819	1542	4653	420	323	59
1997	57	7890	1497	5089	460	425	61
1998	66	8344	1447	5453	450	236	67
1999	74	7470	864	6238	383	247	68
2000	81	6828	807	6225	442	255	68
2001	80	7566	1089	6658	532	235	70
2002	90	9011	1282	6952	492	245	75
2003	59	9023	618	14517	486	226	77
2004	70	8985	586	15341	632	241	84
2005	63	8664	788	16120	571	268	93
2006	66	9709	751	17102	753	246	103
2007	56	11295	893	18136	762	240	117
2008	59	12415	1004	19220	749	284	126
2009	62	11559	718	20396	638	307	136

Source data: China Statistical Yearbook, various issues

Table A6.9: China: Production of Animal Products, 1978-2009, 1000 Tons

	FAO data						China Statistical Yearbooks data							
	Meat-total	Beef	Mutton	Pork	Poultry	Other meat	Meat-total	Beef	Mutton	Pork	Meat residual	Other milk	Cow milk	Eggs
1978	11094	282	321	8772	1531	188	8563	310	360	7890	3	88	883	
1979	13348	315	377	10869	1591	196	10624	230	380	10014	0	237	1070	
1980	14787	342	451	12125	1663	206	12054	269	445	11341	-1	226	1141	2566
1981	15443	352	476	12674	1734	207	12609	249	476	11884	0	258	1291	
1982	16439	364	525	13528	1809	213	13508	266	524	12718	0	341	1618	2809
1983	17084	402	545	14009	1903	225	14021	315	545	13161	0	374	1845	3323
1984	18584	453	587	15366	1939	239	15406	373	586	14447	0	410	2186	4316
1985	20938	511	594	17567	2017	250	17607	467	593	16547	0	395	2499	5347
1986	22894	634	623	19032	2321	284	19171	589	622	17960	0	430	2899	5550
1987	24063	838	720	19490	2687	328	19860	792	719	18349	0	487	3301	5902
1988	26707	1005	803	21295	3255	350	21936	958	802	20176	0	529	3660	6955
1989	28135	1118	963	22346	3371	338	23262	1072	962	21228	0	545	3813	7198
1990	30421	1302	1069	24016	3740	295	25135	1256	1068	22811	0	594	4157	7946
1991	33375	1579	1181	25824	4480	311	27238	1535	1180	24523	0	599	4644	9220
1992	36405	1845	1251	27647	5121	541	29406	1803	1250	26353	0	608	5031	10199
1993	40548	2375	1375	29836	6407	555	32253	2336	1373	28544	0	651	4986	11798
1994	44725	2806	1483	32613	7173	650	36927	3270	1609	32048	0	801	5288	14790
1995	48247	3598	1749	33401	8674	826	42653	4154	2015	36484	0	964	5764	16767
1996	48045	3584	1815	33015	8794	837	45840	4949	2400	40377	-1886	1064	6294	19652
1997	54718	4431	2132	37156	10219	779	52688	4409	2128	35963	10188	800	6011	18971
1998	59124	4824	2350	39900	11222	827	57238	4799	2346	38837	11256	824	6621	20213

	FAO data						China Statistical Yearbooks data							
	Meat-total	Beef	Mutton	Pork	Poultry	Other meat	Meat-total	Beef	Mutton	Pork	Meat residual	Other milk	Cow milk	Eggs
1999	60032	5078	2517	39900	11699	837	59490	5054	2513	40056	11867	893	7176	21347
2000	63177	5352	2744	41406	12873	803	60139	5131	2641	39660	12707	917	8274	21820
2001	65270	5509	2930	42982	12866	982	61058	5086	2718	40517	12737	974	10255	22101
2002	67764	5866	3170	44367	13383	977	62343	5219	2835	41231	13059	1006	12998	22657
2003	71154	6324	3575	46233	13879	1144	64433	5425	3087	42386	13535	1023	17463	23331
2004	67912	5625	3332	44479	13236	1240	66087	5604	3329	43410	13744	1078	22606	23706
2005	71188	5703	3504	46622	14055	1304	69389	5681	3501	45553	14654	1115	27534	24381
2006	72687	5788	3642	47591	14286	1380	70890	5767	3638	46505	14981	1091	31934	24240
2007	70428	6153	3830	43933	15039	1473	68657	6134	3826	42878	15819	1081	35252	25290
2008							72787	6132	3803	46205		2256	35558	27022
2009							76497	6355	3894	48908		2138	35188	27425

Source: *China Statistical Yearbook*, various years & FAO

Table A6.10: China: Value Added in Township and Village Enterprises, 1978-2006 (100 million yuan)

	Total	Primary	Secondary	Industry	Construction	Transportation	Trade	Tourism & Catering	Others	Tertiary
1978	208.3	15.4	172.1	159.5	12.6	9.0	4.3	4.9	2.6	20.8
1979	228.3	16.9	191.5	175.2	16.3	10.7	3.8	4.4	1.2	20.0
1980	285.3	17.4	233.7	209.2	24.5	12.7	9.1	9.6	2.8	34.2
1981	321.5	16.7	270.8	245.5	25.3	13.2	9.2	9.7	1.9	33.9
1982	374.4	19.5	302.1	272.3	29.8	15.9	10.9	11.7	14.4	52.8
1983	408.4	21.2	334.9	302.3	32.5	17.3	12.8	11.9	10.3	52.3
1984	633.2	23.5	501.8	417.9	83.9	29.1	24.3	20.9	33.7	107.9
1985	772.3	18.6	614.0	518.1	95.9	45.2	40.2	30.4	23.9	139.7
1986	873.2	17.1	711.6	595.8	115.7	50.6	45.7	29.3	18.9	144.5
1987	1416.4	20.8	1208.8	1065.2	143.6	69.4	59.9	37.5	20.0	186.9
1988	1742.0	22.3	1491.6	1305.6	186.0	82.9	82.1	41.6	21.6	228.1
1989	2083.2	24.4	1767.8	1562.2	205.7	108.7	105.5	50.8	26.0	290.9
1990	2504.3	36.7	2095.9	1855.4	240.5	166.1	120.2	71.2	14.2	371.7
1991	2972.1	44.6	2500.6	2227.1	273.4	181.3	132.7	98.1	14.9	427.0
1992	4485.3	56.5	3780.3	3350.1	430.2	272.3	233.7	126.5	16.0	648.5
1993	8006.8	103.0	6722.6	5935.7	786.9	480.5	446.1	220.8	33.7	1181.2
1994	10928.0	207.6	9048.4	8086.7	961.7	601.0	721.3	295.1	54.6	1672.0
1995	14595.2	279.8	12085.4	10804.0	1281.4	804.2	960.1	391.3	74.5	2230.0
1996	17659.3	344.7	14064.8	12627.7	1437.1	1146.0	1428.8	569.3	105.7	3249.8
1997	20740.3	321.8	16182.9	14518.0	1664.9	1272.7	1841.4	856.2	265.3	4235.6
1998	22186.5	346.2	17311.3	15530.3	1781.0	1361.4	1969.8	915.9	281.9	4529.0
1999	24882.6	338.7	19318.7	17374.1	1944.6	1509.5	2311.8	1103.0	300.9	5225.2
2000	27156.2	313.9	20913.2	18812.4	2100.8	1657.7	2625.6	1288.5	357.5	5929.2
2001	29356.4	286.6	22508.2	20314.7	2193.5	1821.9	2955.7	1375.2	408.7	6561.6
2002	32385.8	341.8	25060.8	22773.0	2287.8	1809.5	3036.4	1637.1	500.2	6983.2
2003	36686.3	519.0	28156.8	25745.3	2411.5	1965.2	3420.4	2016.0	608.8	8010.4
2004	41875.4	564.4	32024.6	29358.6	2666.0	2188.7	3909.2	2247.6	880.9	9226.4
2005	50534.3	580.4	38885.9	35662.1	3223.8	2582.7	4782.2	2802.1	901.0	11068.0
2006	57955.4	660.7	44561.9	40864.4	3697.6	2961.5	5482.6	3257.1	1031.6	12732.8

Source: China Statistical Yearbook, various years, *National Agricultural Statistical Abstracts*, various years

Table A6.11: China: Employment in TVEs, 1978-2006, (million persons) Table 5.4

	Total	Primary	Secondary	Industry	Construction	Tertiary	Transportation	Trade	Tourism*	Others
1978	28.27	6.08	19.70	17.34	2.36	2.48	1.04	0.54	0.59	0.31
1979	29.09	5.33	21.13	18.14	2.98	2.64	1.17	0.57	0.59	0.31
1980	30.00	4.56	22.77	19.42	3.35	2.67	1.14	0.62	0.62	0.29
1981	29.70	3.80	23.30	19.81	3.49	2.60	1.07	0.60	0.63	0.29
1982	31.13	3.44	24.94	20.73	4.21	2.75	1.13	0.63	0.66	0.32
1983	32.35	3.09	26.51	21.68	4.83	2.75	1.10	0.71	0.68	0.25
1984	38.48	2.84	32.32	25.49	6.83	3.32	1.29	0.70	0.83	0.50
1985	69.79	2.52	51.51	41.04	10.47	15.76	5.16	5.88	3.67	1.05
1986	79.37	2.41	60.32	47.62	12.70	16.64	5.41	4.86	3.65	2.71
1987	88.05	2.44	66.41	52.67	13.74	19.20	6.23	6.01	4.50	2.46
1988	95.45	2.50	71.88	57.03	14.85	21.07	6.84	6.72	5.12	2.39
1989	93.67	2.39	70.28	56.24	14.04	21.00	6.99	6.92	5.14	1.94
1990	92.65	2.36	69.19	55.72	13.47	21.10	7.11	7.03	4.91	2.05
1991	96.14	2.43	72.00	58.15	13.85	21.70	7.33	7.42	5.06	1.89
1992	106.25	2.62	78.89	63.36	15.52	24.74	8.00	8.67	5.80	2.28
1993	123.45	2.85	90.86	72.60	18.27	29.73	9.31	10.57	7.00	2.85
1994	120.17	2.60	85.84	69.62	16.22	31.73	7.26	12.58	7.75	4.15
1995	128.62	3.14	94.97	75.65	19.33	30.51	9.52	12.26	6.77	1.97
1996	135.08	3.36	98.09	78.60	19.49	33.63	10.62	13.85	7.40	1.76
1997	130.50	2.77	93.36	76.35	17.01	34.38	9.23	14.77	7.99	2.39
1998	125.37	2.74	89.68	73.34	16.34	32.94	8.86	14.18	7.68	2.22
1999	127.04	2.47	90.09	73.95	16.13	34.48	8.86	15.14	8.35	2.13
2000	128.20	2.22	90.48	74.67	15.81	35.50	8.98	15.57	8.64	2.30
2001	130.86	2.00	91.80	76.15	15.64	37.06	9.03	16.44	9.25	2.35
2002	132.88	2.05	91.28	76.68	14.60	39.54	8.62	16.91	11.33	2.69
2003	135.73	2.90	92.65	78.56	14.08	40.18	8.48	16.73	12.10	2.86
2004	138.66	2.85	95.37	81.61	13.76	40.45	8.44	16.99	12.44	2.57
2005	142.72	2.85	98.15	84.52	13.63	41.72	8.47	17.84	12.73	2.68
2006	146.80	2.73	97.70	85.03	12.67	46.37	9.47	19.58	14.24	3.08

Source: same as Table A6.10. * includes catering

Table A6.12: TVE Value Added in National Total, 1978-2006 %

	Total	Primary	Secondary	Industry	Construction	Tertiary
1978	5.7	1.5	9.9	9.9	9.1	2.4
1979	5.6	1.3	10.0	9.9	11.3	2.3
1980	6.3	1.3	10.7	10.5	12.5	3.5
1981	6.6	1.1	12.0	12.0	12.2	3.2
1982	7.0	1.1	12.7	12.6	13.5	4.5
1983	6.8	1.1	12.7	12.7	12.0	3.9
1984	8.8	1.0	16.2	15.0	26.5	6.0
1985	8.6	0.7	15.9	15.0	23.0	5.4
1986	8.5	0.6	15.8	15.0	22.0	4.8
1987	11.7	0.6	23.0	23.2	21.6	5.2
1988	11.6	0.6	22.6	22.6	23.0	5.0
1989	12.3	0.6	24.3	24.1	25.9	5.3
1990	13.4	0.7	27.2	27.1	28.0	6.3
1991	13.6	0.8	27.5	27.5	26.9	5.8
1992	16.7	1.0	32.3	32.6	30.4	6.9
1993	22.7	1.5	40.9	41.8	34.7	9.9
1994	22.7	2.2	40.3	41.5	32.4	10.3
1995	24.0	2.3	42.1	43.3	34.4	11.2
1996	24.8	2.5	41.6	42.9	32.8	13.9

	Total	Primary	Secondary	Industry	Construction	Tertiary
1997	26.3	2.2	43.1	44.1	36.0	15.7
1998	26.3	2.3	44.4	45.7	35.7	14.8
1999	27.7	2.3	47.1	48.4	37.6	15.4
2000	27.4	2.1	45.9	47.0	38.0	15.3
2001	26.8	1.8	45.5	46.6	37.0	14.8
2002	26.9	2.1	46.5	48.0	35.4	14.0
2003	27.0	3.0	45.1	46.9	32.2	14.3
2004	26.2	2.6	43.3	45.0	30.7	14.3
2005	27.3	2.6	44.4	46.2	31.1	14.8
2006	26.8	2.7	43.0	44.8	29.8	14.4

Source: Table A6.10 and *China Statistical Yearbook*, various years

Table A6.13: China: Share of TVE Employment in National Total, 1978-2006 (%)

	Total	Primary	Secondary	Tertiary
1978	7.04	2.15	28.37	5.07
1979	7.09	1.86	29.29	5.09
1980	7.08	1.57	29.54	4.82
1981	6.79	1.28	29.11	4.37
1982	6.87	1.11	29.88	4.51
1983	6.97	0.99	30.54	4.16
1984	7.98	0.92	33.71	4.29
1985	13.99	0.81	49.60	18.86
1986	15.48	0.77	53.78	18.89
1987	16.68	0.77	56.63	20.44
1988	17.57	0.78	59.15	21.21
1989	16.93	0.72	58.68	20.73
1990	14.31	0.61	49.93	17.62
1991	14.68	0.62	51.38	17.53
1992	16.06	0.68	54.96	18.89
1993	18.48	0.76	60.72	20.99
1994	17.82	0.71	56.06	20.45
1995	18.90	0.88	60.67	18.08
1996	19.59	0.96	60.54	18.76
1997	18.69	0.79	56.42	18.65
1998	17.75	0.78	54.02	17.47
1999	17.79	0.69	54.86	17.95
2000	17.78	0.62	55.79	17.91
2001	17.92	0.55	56.37	18.32
2002	18.02	0.56	57.85	18.75
2003	18.24	0.79	57.63	18.42
2004	18.44	0.81	56.36	17.58
2005	18.82	0.84	54.27	17.55
2006	19.21	0.84	50.82	18.84

Source: Same as Table A6.12

7. Production, Consumption and Composition of Food in Post-1978 Reforms China

7.0 INTRODUCTION

The previous chapter examined the trends in agricultural output and domestic supply relative to population trends. Population growth slowed down from the mid-1980s compared to earlier periods and fell sharply below 1 percent annual rate from the mid-1990s onwards. While the food grains growth rate was well above the population growth rate up to the mid 1990s, entailing rising output per capita, thereafter grain output became completely stagnant and in fact registered a small decline, comparing the terminal triennium 2004-06 to the initial triennium 1995-97 (larger decline is observed in the intermediate period). So despite the decelerating population growth rate, per capita grain output declined over this decade quite significantly. Paradoxically, much larger net imports of food grains took place up to the mid-1990s, when domestic production was rising, thus taking per head supply above domestic output, than later on when the output situation worsened (Table 7.1a & 7.1b).

Table 7.1a: China: Production of Cereals, Grain and Population, 1978-2009*

	Cereals	Grain	Population
	10,000 Metric Tons		Millions
1978-79	23511.9	31844.3	Population
1980-82	24357.6	33336.0	969.01
1983-85	29226.9	39123.2	1001.44
1986-88	29635.0	39619.0	1044.05
1989-91	32803.4	42969.3	1092.78
1992-94	34227.9	44808.2	1142.87
1995-97	37425.2	48844.1	1185.13
1998-00	37473.1	49428.5	1223.79
2001-03	33401.3	44679.6	1257.63
2004-06	37118.7	48384.5	1284.36
2007-09		52037.8	1307.31
Growth Rates, Compound (%)			
	Cereals	Grain	Population
1978-9 to 1986-88	2.94	2.77	1.51

1986-88 to 1995-97	2.63	2.35	1.27
1995-97 to 2004-06	-0.09	-0.11	0.74
OVERALL 1978-79 to 2007-09	n.a.	1.53	1.08

Grain includes tubers at 1/5th weight, pulses and soybeans; 3-year averages except first period 1978-79. Source: Table A6.8 and CSY various issues

Table 7.1b: China: Changes in Population and Output of Grain and Cereals, 1978-2006 (Various Periods), %

	Output		Population
	Cereals	Grain	
1978-79 to 1986-88	26	24.4	12.8
1986-88 to 1995-97	26.3	23.3	12.1
1995-97 to 2004-06	-0.82	-0.94	6.8
Overall 1978-79 to 2004-06	57.87	51.94	34.91

Source: Table A6.8 and CSY various years

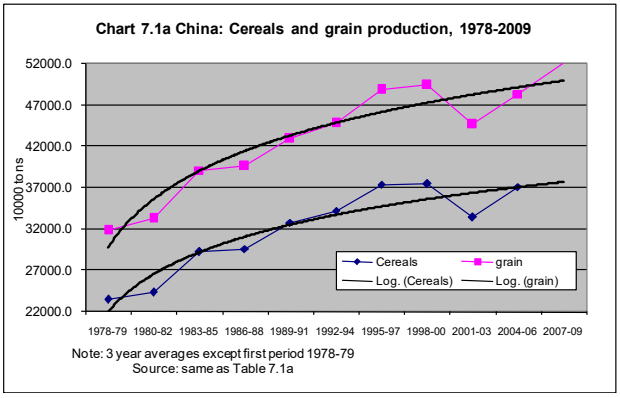


Table 7.1c: China: Production, Domestic Supply and Utilization of Food Grains*, 1978-2007 (3 year averages except 1978-79) million tons

	Population	Production	Net Imports	Domestic Supply	Food	Feed	Other uses*
1978-79	969.0	273.0	13.5	280.8	204.4	50.2	26.2
1980-82	1001.4	278.5	18.2	300.3	218.9	53.9	27.5
1983-85	1044.1	327.3	11.8	336.9	243.5	61.4	32.0
1986-88	1092.8	329.8	12.8	343.5	245.8	61.8	35.9
1989-91	1142.9	360.8	15.3	371.8	254.7	76.4	40.8
1992-94	1185.1	377.3	4.0	386.4	257.9	83.5	44.9

1995-97	1223.8	413.0	16.2	424.8	259.8	113.7	51.4
1998-00	1257.6	417.0	0.5	415.0	258.7	109.7	46.6
2001-03	1284.4	376.5	-4.3	383.3	238.6	101.1	43.6
2004-06	1307.3	409.7	9.1	419.4	226.8	130.1	62.5
2007	1321.3	428.4	0.3	422.8	222.0	133.2	67.6
	Per Capita, Kg				**Share in Domestic Supply**		
	Production	**Domestic Supply**	**Food**	**Feed**	**Food**	**Feed**	**Indirect***
1978-79	281.7	290.6	207.8	51.0	71.5	17.5	28.5
1980-82	278.1	300.2	215.0	52.9	71.6	17.6	28.4
1983-85	313.5	323.0	229.5	57.9	71.1	17.9	28.9
1986-88	301.8	313.9	221.4	55.7	70.5	17.7	29.5
1989-91	315.7	323.9	219.4	65.7	67.7	20.3	32.3
1992-94	318.3	324.2	214.6	69.5	66.2	21.4	33.8
1995-97	337.5	345.5	209.9	91.9	60.7	26.6	39.3
1998-00	331.6	328.5	203.4	86.3	61.9	26.3	38.1
2001-03	293.1	296.5	183.3	77.7	61.8	26.2	38.2
2004-06	313.4	317.8	171.9	98.6	54.1	31.0	45.9
2007	324.2	316.4	166.2	99.7	52.5	31.5	47.5

Food grains refer to cereals, starchy roots at $1/5^{th}$ weight and pulses
Indirect includes allocations towards seed, waste in processing and other uses (food and non-food manufacture). Source: Table A7.1

Instead of rising to compensate and maintain domestic supply, production became stagnant after the mid-1990s. Net imports also declined and instead there emerged net exports in a period of especially low output during 2001-03. Instead of moderating falling per head output, trade thus aggravated the situation and even heavy drawing down of stocks could not prevent the lowest per capita supply being registered in over two decades during 2001-03.

The question of food grain imports is discussed in detail later. The other important observation is that even out of stagnant output, a progressively higher share of grain supply was being diverted to indirect use, mainly animal feed. Indirect consumption of grain (according to the Chinese definition) in the form of animal feed rose from roughly 18 percent of domestic supply in the mid-1980s to over 26 percent by the mid-1990s in the rising output phase, and continued to rise further to nearly 31.5 per cent by 2007, even in the phase of stagnant output. Over the entire period 1978-79 to 2007-09, grain output grew at 1.53 per cent.

In order to understand the significance of these observations, it is necessary to get some theoretical confusions out of the way. It has been observed from the FAO-FBS data – which has been recorded on a comparable basis since the 1960s - that in developing countries as per capita average income rises, as a rule the per

capita demand for grains also rises quite sharply since in addition to being directly consumed, much more grain is used as feed for raising the output of animal products, and also more grain is processed. This will be discussed in greater detail below. In short there is a positive income elasticity of demand for grain and what is true of a country which raises its per head income over time, is true cross-sectionally, of countries which have widely different levels of income at any given point of time. Looking at countries at different levels of per capita income in 2007, the latest year that FAO-FBS data are available, we see that the highest grain consumption per head in the world (nearly 900 kgs annually) is in the richest country USA, followed by Western European countries (500 kgs to 650 kgs) and the lowest per head grain consumption is in the South Asian, African and the least developed countries, ranging between 175 kg to 200 kgs per head. Middle-income countries like Mexico record intermediate figures of around 350-400 kgs per head. This pattern has been constant for the last few decades; only the grain consumption numbers have risen over time (except in both China and India in the last 15 years, despite a rise in their per capita incomes). Further, the richer the country the higher is the observed share of its grain consumption, which is indirect, with USA and India constituting the extremes. Only one-eighth of US grain consumption is direct and the bulk, nearly 88 percent is indirect, while only one-eighth of India's grain consumption is indirect while the bulk is direct. By 2007, China's grain consumption per capita was about the world average level and nearly half was indirectly consumed.

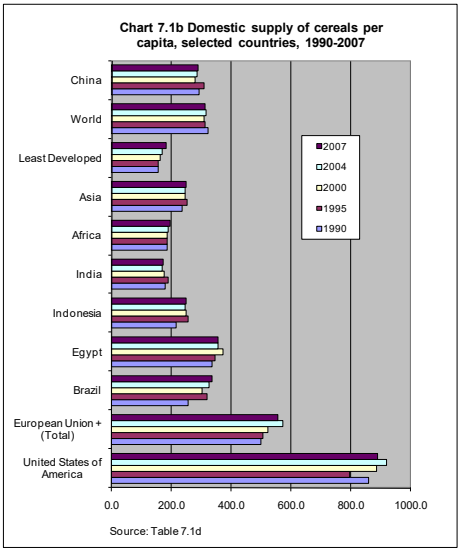


Table 7.1d: Comparison of Cereal Production and Utilization: Selected Countries and Regions, 2007

	Millions	1000 Metric Tons					
	Population	Production	Net Imports	DS*	Feed	Food	Other Uses
European Union	493.5	261015	959	275029	168316	61710	45021
USA	308.7	412169	-96574	274560	162027	34450	78088
Brazil	190.1	65758	-1140	64118	33179	21695	9244
Egypt	80.1	19275	9292	28632	7099	18476	3077
Indonesia	224.7	51412	7493	56031	6102	39368	10562
China	1336.6	395286	-2743	386390	120199	203774	62417
India	1164.7	212344	-7196	202884	7950	177682	17254
Africa	962.7	130802	53214	188864	26480	138687	23753
Asia	3963.8	944389	66559	987498	225697	619473	142531
LDCs	771.1	125892	19377	140428	10677	105525	24259
World	6590.5	2121320	-21440	2066740	745879	966236	355253

Kgs Per Capita Per Year					
	Food	Feed	Other Uses	DS*	
USA	111.6	524.9	253.0	889.5	
Brazil	114.1	174.5	48.6	337.2	
European Union	125.1	341.1	91.2	557.4	
LDCs	136.9	13.8	31.5	182.2	
Africa	144.1	27.5	24.7	196.3	
China	152.5	89.9	46.7	289.1	
India	152.6	6.8	14.8	174.2	
Asia	156.3	56.9	36.0	249.2	
Indonesia	175.2	27.2	47.0	249.4	
Egypt	230.8	88.7	38.4	357.9	
World	146.6	113.2	53.9	313.7	

*DS – domestic supply: Source: Patnaik (2011) and FAO-SUA

In this context, it is important to mention that there is a widely held but clearly incorrect idea among economists that the consumption demand for grain is negatively related to income, namely there is a negative income-elasticity of demand for grain. It is argued that as their income rises, consumers diversify away from consuming grain, which becomes an inferior good, to vegetables, fruit and animal products. So if we observe that per head grain output is declining and is not compensated by imports so that per head grain supply (which is identically equal to demand) is also falling, there is nothing surprising or alarming about it since it merely reflects diversification of diets to higher value foods as people get better off.

A. Deaton and J Dreze (2005, 2009) had put forward this argument in the light of falling per head grain consumption in India to say that it was not an adverse development and had claimed that USA had lower per head grain consumption than India. However the argument takes it for granted that 'grain consumption' is

direct consumption by humans alone and takes no account of the fact that it must include indirect consumption of grain, of which the most important component is livestock feed required for producing the very animal products, without which dietary diversification cannot occur.

Dietary diversification, including much higher consumption of animal products, is indeed usually seen as average incomes rise, but this is associated with much higher demand for grain, not lower demand. In China, corresponding to the 0.5 per cent increase in total food grain production per capita, trend annual growth rates in the various components of animal food products were at the minimum of 5.7 per cent for pork, close to 10 per cent for poultry and over 12 per cent in the case of beef, resulting in a combined meat output growth of nearly 7 per cent p.a. during 1978-2007. In the absence of significant increases in net imports of either food grains or feed (grains), and assuming minimum grain to meat conversion rates, this would imply a net decline in the availability of food grains for direct consumption.

In a context of rising income inequalities of various forms – inter-personal, inter-regional, intra-regional, rural-urban, inter as well as intra rural and urban – a net decline in food grain availability for direct consumption can be of minimum concern only if the initial levels were so high as not to affect prescribed nutritional standards. As observed by the trends in food availability during the pre-1978 reforms period, by the late 1970s, average per capita nutritional levels had transcended the minimum standards but not as high as to declare the end of food insecurity.

Adding a final dimension to the changes after 1978, namely the abolition of the system of guaranteed minimum entitlement of food to every household under a collective framework, to one where individual incomes determine levels of food (entitlements) consumption, it would be a straight-forward inference that declines in food availability below the minimum standard should have resulted for a significant proportion of the population in recent years, compared to the initial years of reform. These are the issues taken up for theoretical and empirical exploration in this chapter.

7.1 TRENDS IN FOOD GRAIN AVAILABILITY: 1978-2009

In this section, an exercise similar to the one in Chapter 4 is undertaken for the period beginning in 1978. Annual Food Balance Sheets for the period 1978-2007 have been compiled from the FAOs Supply and Utilisation Accounts (SUA) in order to examine the changes in the availability of various food categories and their components that would also reveal the changes in the composition of food over the period.

7.1a Production and Domestic Supply of Food Grains

Table 7.1a presents the broad picture of China's production and domestic availability of food grains, 1978-2007. The significant columns in the table are net imports and the share in domestic supply that is consumed directly as food. The widening differences in per capita domestic supply and that available as food, owes to the disappearance of food grains in the form of feed, food manufacturing and other uses (besides seed). The feed component is taken up later in the chapter.[1] It is interesting to note that even in the first phase of reforms and continuing until the mid-1990s, the share of net imports in domestic supply was significant in all the years, excepting during 1985-86 and 1992-94. The former period marks a transition from a burst of production to declines in growth rates of food grains as discussed in the previous chapter. The period 1992-94 was yet another transition period when the Chinese economy was undergoing an adjustment following high inflation, beginning towards the end of the 1980s. Nevertheless, net imports of between 15 per cent and 20 per cent during 1979-1983 and 1987-90 and further during 1995-96, were in all likelihood owing to greater demand for feed grains and partly aimed at replenishing stocks. More importantly, cereals formed a very large proportion of both total food grains as well as net imports until 1996. In the following period, 1997-2002, this component was significantly reduced in 2003 when net exports went up to 11.5 per cent and net imports to14 percent.

Net imports of various components of food grains compiled in Table 7.1e shows that wheat and maize have been the major cereals in total trade in food grains over the period. The table further reveals that wheat has rarely been net exported (except in 2003 and 2007, amounting to low volumes of 0.7 and 1.7 million tons respectively). In the case of maize, the maximum exported was in 2003 amounting to over 11 million tons owing to a high production levels in 2002 and 2003 with a corresponding fall in feed demand in those years. The large imports of wheat over the period until 1995 were aimed at increasing availability for northern China which is prone to frequent droughts and inadequate irrigation (relative to southern China).

The importance of grain imports, at least until 1996, may appear insignificant if viewed as a share of domestic supply (never exceeded 6.6 per cent in any year) but in

1 Though the FAO-SUA provides data on changes in stocks of every food category, they represent only the officially declared stocks at the central and provincial level and unlikely to reflect those at local and household levels, which according to scholars is an unknown but significant volume. Private conversations with scholars at the China Agricultural University revealed that the national government is unaware of the quantum of stocks held even at the provincial level. The stock figures in the FAO dataset reveal side swings on an annual basis, making it unsuitable for analytical purposes. See Ke (2000) for a study of on-farm stocks of grains.

terms of global trade in grains, the quantum of imports assume greater importance. Moreover, as Table 7.1a shows, there are wide year-to-year variations in net grain imports. But when the data is examined over a period, the significance of grain imports emerges more clearly. For the period 1978-1996, cumulative net grain imports were close to 259 million metric tons (mt), averaging 13.6 million mt per year. This amounts to about 90 per cent of net grain imports for the entire period 1978-2007. Brown's (1995) thesis concerning China's impending inability to meet food requirements and greater dependence on global grain markets emerged precisely in this context of China's increasing imports of grain. The argument here is based on the emerging combination of declines in cultivated and sown areas potentially limiting or even contracting grain production and increases in population and incomes leading to expanding demand for grains as food as well as increasing consumption of animal products leading to additional grain demand as feed. According to Brown's estimates, by 2030, grain production would decline from 341 million mt in 1990 to 272 million mt, whereas consumption would increase to 479 million mt, assuming no increase in per capita consumption (from the levels in early 1990s) requiring grain imports of over 200 million mt in 2030. In a scenario where China's per capita consumption in 2030 equals Taiwan's levels of the late 1990s of 400 kgs per capita, the import demand would be of the order of 370 million mt.

Table 7.1e: China: Net Imports of Food Grains, 1978-2007 (Million Metric Tons)

	All Foodgrains	All Cereals	Wheat	Maize
1978-79	13.5	13.5	9.1	4.4
1980-84	17.3	17.4	12.7	4.1
1985-89	12.1	12.3	12.1	-0.2
1990-94	7.9	8.5	10.9	-2.7
1995-99	10.8	10.7	5.6	3.7
2000-04	-0.5	-1.7	2.2	-4.4
2005-07	4.4	1.4	0.9	-0.9
Indices				
	All Foodgrains	**All Cereals**	**Wheat**	**Maize**
1978-79	100.0	100.0	100.0	100.0
1980-84	128.4	129.5	140.4	93.2
1985-89	89.5	91.2	133.9	-3.7
1990-94	59.0	63.4	120.3	-60.7
1995-99	79.9	79.3	61.8	83.4
2000-04	-3.3	-12.9	24.2	-98.7
2005-07	32.9	10.7	10.1	-21.3

Source: Table A7.2

Numerous other projections of China's future grain demand and consumption have been made since Brown's estimates, based on varying assumptions with regard to changes in production (supply side) and consumption (demand side).[2] All the projections estimate growing demand for both food and feed, using different projected values of income elasticity of demand for various animal products. These projections also vary on the predictions regarding production increases based on various assumptions about decline or reclamation of cultivable land, changes in yields, inputs and irrigation infrastructure. But one crucial factor that would determine future demand for food and feed arises from changes in income distribution and therefore in elasticity of demand for grain directly as food and indirectly as feed by different income classes. Though this factor can neither be predicted nor projected with any degree of accuracy, it would be an important determinant of the quantum of grains that would be available for consumption by different income classes. This aspect is discussed in greater detail in sections 7.4 and 7.5 below.

7.1B Food Grain Disappearance during 1978-2009

In Table A7.1, grain available for direct consumption (one component in the disappearance of food grains) reveals a steady decline as a share of domestic supply from almost 73 per cent in 1978 to a little over 52 per cent in 2007. This decline was also associated with a net reduction in actual amount available for direct consumption. In 1978, the actual quantity available per capita of grain for direct consumption was close to 206 kgs. This rose to an all time high of nearly 233 kgs in 1984 but subsequently declined consistently to a level less than 170 kgs by 2006-07. As regards indirect consumption of food grains – that, which is converted to a source of animal food – there has been a steady increase over the entire period.

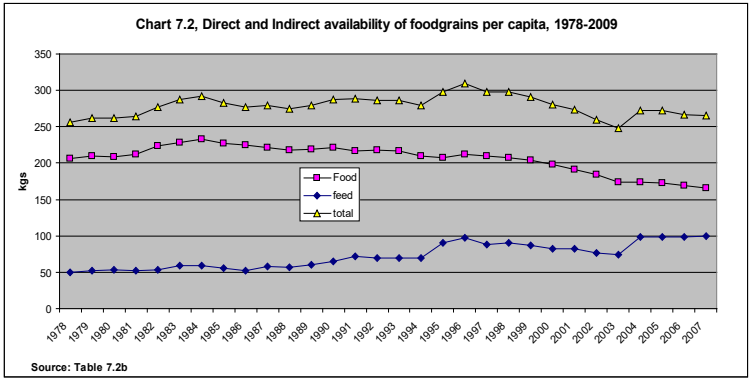
Table 7.1f presents both the components of total demand for grains[3], namely food and feed. It is clearly seen that per capita availability of both components together steadily fell from 1984 onwards - from 292 kgs to 279 kgs in 1994. During 1995-99, though direct consumption was below the all time high of 1984, indirect consumption was 90 kgs on average, rising from 70kgs per capita on average during 1991-94.

Beyond 1996, the decline continued until 2003, reaching the lowest for the entire period before recovering and falling again during 2004-07. These are easily inferred

2 Rosegrant et al (1995), Huang et al (1997), USDA/ERS (1994, 1996), Mitchell and Ingco (for the World Bank) (1993), Simpson et al (1994), OECD (1995), FAO (1995), Nyberg (1997) etc. See Zhang (2004), Fan and Agcaoili-Sombilla (1997) and Huang and Rozelle (1998) for a summary and evaluation of some of these projections.

3 The quantum of total pulses (both as food and as feed) available was already at a low level of about 6 kgs in 1978 and fell to less than 2.5 kgs per capita.). See Table 7.1c

from Chart 7.1, mapping the total availability of the three components of food grains for 1978-2007 and Chart 7.2 representing the same figures by direct and indirect components of total availability.



Though, the direct and indirect demand for grain, represented by the categories of food and feed in the supply and utilization tables form the predominant source of grain disappearance, there are two other components that are significant, namely food manufacture, and waste and other uses. The former in the case of grain is still not an important component in China, with a share of less than 3 per cent during most of 1978-2007 (excepting in 1995, 2002 and 2003 when it was marginally above that). But the latter component assumes importance given the nature of an integrated livestock system, which almost entirely absorbs recoverable waste (from de-husking and other processing besides household waste). The quantum of additional feed that can emerge from this source is substantial and is discussed in section 7.4 below

Table 7.1f: China: Direct and Indirect Availability of Food Grains Per Capita, 1978-2007, kgs

	All food grains		Cereals-All		Wheat		Rice (Milled Equivalent)		Maize		Starchy Roots	
	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc
1978-79	207.8	51.0	182.4	41.2	54.8	1.4	86.0	1.4	25.1	33.0	20.4	8.8
1980-84	221.2	55.5	200.1	45.9	68.9	2.4	91.8	2.1	24.7	36.4	16.8	8.4
1985-89	222.2	56.4	206.5	45.7	79.3	1.7	94.3	2.5	22.9	37.7	12.6	9.7
1990-94	216.5	69.2	203.1	58.0	81.3	2.7	93.2	2.1	21.6	47.6	11.8	10.4
1995-99	208.3	90.5	193.6	76.9	79.4	3.9	91.2	4.1	18.5	63.7	13.2	12.2
2000-04	184.4	82.7	167.8	69.5	68.7	0.9	82.6	2.2	13.5	63.1	15.4	11.3
2005-07	169.3	98.9	154.4	88.4	68.3	4.1	77.2	7.1	6.9	74.5	13.7	9.0

Indices												
	All Food Grains		Cereals-All		Wheat		Rice (milled equivalent)		Maize		Starchy Roots	
	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	106.5	108.7	109.7	111.5	125.9	175.3	106.7	145.4	98.4	110.4	82.3	95.2
1985-89	106.9	110.6	113.3	110.9	144.8	125.0	109.7	177.5	91.4	114.2	61.6	110.1
1990-94	104.2	135.6	111.4	140.9	148.5	199.9	108.4	144.3	86.1	144.4	57.7	117.5
1995-99	100.2	177.5	106.1	186.7	145.0	281.2	106.0	286.7	73.9	193.0	64.7	138.6
2000-04	88.8	162.1	92.0	168.8	125.6	68.4	96.0	151.5	53.7	191.1	75.3	128.1
2005-07	81.5	194.0	84.7	214.6	124.8	295.5	89.8	495.5	27.4	225.8	67.0	102.1
Change over periods (%)												
	All Food Grains		Cereals-All		Wheat		Rice (milled equivalent)		Maize		Starchy Roots	
	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc	Foodpc	Feedpc
1978/79-1980-84	6.5	8.7	9.7	11.5	25.9	75.3	6.7	45.4	-1.6	10.4	-17.7	-4.8
1980/84-1985/89	0.4	1.8	3.2	-0.5	15.0	-28.7	2.8	22.1	-7.1	3.4	-25.2	15.7
1990/94-1995/99	-2.6	22.6	-1.7	27.0	2.5	60.0	-1.2	-18.7	-5.9	26.4	-6.3	6.8
1990/94-1995/99	-3.8	30.9	-4.7	32.5	-2.3	40.6	-2.2	98.7	-14.1	33.7	12.2	18.0
1995/99-2000/4	-11.4	-8.7	-13.3	-9.6	-13.4	-75.7	-9.4	-47.2	-27.3	-1.0	16.3	-7.6
2000/04-2005/07	-8.2	19.6	-8.0	27.2	-0.6	332.0	-6.5	227.1	-49.0	18.1	-11.0	-20.3

Source: Table A7.3 foodpc (food per capita) feedpc (feed per capita)

A significant amount of grain was diverted from direct consumption towards production of animal products, which as examined in the previous chapter revealed enormous increases in per capita terms. Besides, animal products, there were also impressive increases in the availability of vegetables, fruits and vegetable oils, besides modest increases in sugar. The next section examines the trends in the non-grain food sector.

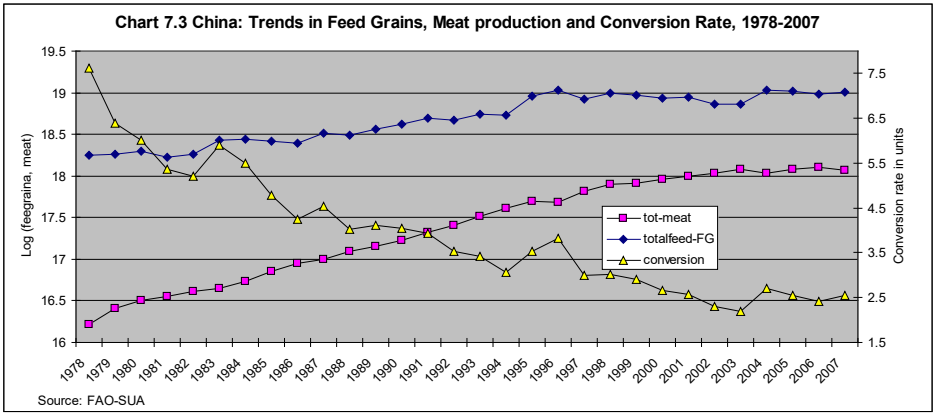
7.2 TRENDS IN NON-GRAIN FOOD AVAILABILITY: 1978-2007

The diversification of food production during 1978-2009 discussed in the previous chapter entailed a rapid expansion of sown areas to vegetables and fruits. Given the slower expansion in total sown area meant a net reduction of areas under tubers and grain crops, with the exception of maize. The increase in maize areas was however, as seen in Table 7.1c, almost entirely directed at increasing the availability as feed. Maize stands out starkly in this process of diversification, with the ratio of direct and indirect availability falling drastically from (2:3 or) 1:1.3 in 1978 to 1:11 by 2006-07. The ratio however was only 1:3.7 on average, until 2003.

Table 7.2a: China: Per Capita Availability of Vegetables and Fruits, 1978-2007, Kgs

	Vegetables					Fruits		
	Total	**Tomatoes**	**Onions**	**Other veg.**	**Total**	**Citrus**	**Apples**	**Other**
1978-79	52.0	5.0	3.2	43.8	7.3	0.8	2.3	4.3
1980-84	60.9	5.2	3.3	52.5	8.5	1.4	2.4	4.7
1985-89	91.9	5.5	3.8	82.6	14.0	3.1	3.1	7.8
1990-94	115.2	7.2	4.5	103.4	21.3	5.3	5.0	11.0
1995-99	172.2	11.7	7.2	153.2	37.4	7.7	11.2	18.6
2000-04	250.8	17.8	11.0	222.0	48.3	9.6	11.1	27.6
2005-07	276.2	20.8	13.0	242.5	61.4	13.8	13.1	34.5
Indices								
	Vegetables					**Fruits**		
	Total	**Tomatoes**	**Onions**	**Other veg.**	**Total**	**Citrus**	**Apples**	**Other**
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	117.3	103.2	104.8	119.9	116.2	181.3	105.8	110.2
1985-89	176.9	110.4	121.3	188.7	191.8	410.7	137.8	181.9
1990-94	221.7	144.8	142.2	236.4	292.1	712.0	222.2	255.3
1995-99	331.4	234.8	229.2	350.1	512.9	1024.0	497.8	431.6
2000-04	482.7	356.8	347.9	507.4	662.2	1282.7	494.2	641.9
2005-07	531.6	415.3	411.6	554.2	840.6	1835.6	580.7	803.1
Change over Periods (%)								
	Vegetables					**Fruits**		
	Total	**Tomatoes**	**Onions**	**Other veg.**	**Total**	**Citrus**	**Apples**	**Other**
1978/79-1980-84	17.3	3.2	4.8	19.9	16.2	81.3	5.8	10.2
1980/84-1985/89	50.8	7.0	15.8	57.4	65.1	126.5	30.3	65.0
1990/94-1995/99	25.3	31.2	17.3	25.3	52.3	73.4	61.3	40.4
1990/94-1995/99	49.5	62.2	61.2	48.1	75.6	43.8	124.0	69.0
1995/99-2000/4	45.7	52.0	51.8	44.9	29.1	25.3	-0.7	48.7
2000/04-2005/07	10.1	16.4	18.3	9.2	26.9	43.1	17.5	25.1

Source: Table A7.4



The enormous increase in areas under vegetables and fruits besides maize was compensated for by large declines in areas under rice, wheat and tubers. The reduction in wheat areas and the consequent slow growth over the entire period at 1.7 per cent p.a. was made up by net imports as discussed in the previous section. While that constitutes a brief picture of the diversification of food production, the effect on diversity of food availability took the form of higher per capita availability of vegetables, fruits, alcohol and all categories of animal products. Tables 7.2a, 7.2b and 7.2c present the trends in all these categories during 1978-2007.

Table 7.2b: China: Availability Per Capita of Vegetable Oils, Sugar and Alcoholic Beverages, Kgs

			Alcoholic Beverages			Vegetable Oils
	Sugar*	**Veg. Oil**	**Total**	**Beer**	**other**	**NetM/DS**
1978-79	4.2	2.5	3.4	0.8	2.6	0.1
1980-84	5.6	3.8	6.0	1.7	4.3	0.0
1985-89	7.1	4.9	11.2	5.1	6.1	0.1
1990-94	6.7	6.0	16.2	9.2	7.1	0.2
1995-99	7.5	7.5	22.9	15.3	7.7	0.3
2000-04	6.5	9.0	27.1	19.5	7.6	0.3
2005-07	7.0	8.4	35.2	27.0	8.2	0.3
Indices						
			Alcoholic Beverages			Vegetable Oils
	Sugar*	**Veg. Oil**	**Total**	**Beer**	**other**	**NetM/DS**
1978-79	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	134.0	151.2	177.9	224.0	164.6	39.4
1985-89	170.6	194.4	334.3	674.7	236.2	175.5
1990-94	161.9	240.8	484.8	1221.3	272.3	300.9
1995-99	181.7	299.2	684.2	2034.7	294.6	352.1
2000-04	157.1	360.8	810.1	2605.3	292.3	377.0
2005-07	168.7	334.7	1050.7	3604.4	314.1	462.3
Change Over Periods (%)						
			Alcoholic Beverages			Vegetable Oils
	Sugar*	**Veg. Oil**	**Total**	**Beer**	**other**	**NetM/DS**
1978/79-1980-84	34.0	51.2	77.9	124.0	64.6	-60.6
1980/84-1985/89	27.3	28.6	87.9	201.2	43.5	345.2
1990/94-1995/99	-5.1	23.9	45.0	81.0	15.3	71.5
1990/94-1995/99	12.2	24.3	41.1	66.6	8.2	17.0
1995/99-2000/4	-13.5	20.6	18.4	28.0	-0.8	7.1
2000/04-2005/07	7.4	-7.2	29.7	38.3	7.5	22.6

Source: Table A7.5

Table 7.2c: China: Per Capita Availability of Animal Food Products, 1978-2007, Kgs

									Aquatic Products	
	Tot-Meat	**Beef**	**Mutton**	**Pork**	**Poultry**	**Milk**	**Eggs**	**Total**	**Fresh water**	**Other**
1978-79	12.4	0.3	0.4	9.1	1.6	3.1	2.5	5.2	1.2	4.0
1980-84	15.8	0.4	0.5	12.0	1.8	3.5	3.0	5.7	1.7	4.0
1985-89	21.9	0.7	0.7	16.4	2.5	5.2	5.2	9.4	3.6	5.8
1990-94	30.9	1.6	1.1	21.6	4.6	6.5	8.4	13.9	5.4	8.5
1995-99	43.3	3.5	1.7	27.2	8.3	8.2	14.4	23.5	9.5	14.0
2000-04	52.1	4.5	2.5	31.5	10.5	14.2	17.1	25.6	10.9	14.7
2005-07	54.2	4.5	2.8	32.2	11.3	26.5	17.1	26.1	12.2	13.9
Indices										
									Aquatic Products	
	Tot-Meat	**Beef**	**Mutton**	**Pork**	**Poultry**	**Milk**	**Eggs**	**Total**	**Fresh water**	**Other**
1978-79	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	128.1	140.0	148.6	131.4	111.3	115.4	122.4	109.2	140.0	100.0
1985-89	177.3	246.7	200.0	180.2	156.3	171.1	213.9	180.4	300.0	144.5
1990-94	250.2	533.3	308.6	237.6	290.0	214.4	343.7	267.3	450.0	212.5
1995-99	350.6	1160.0	485.7	299.1	521.3	267.5	586.1	451.2	790.0	349.5
2000-04	421.5	1493.3	708.6	346.2	656.3	466.2	696.3	491.9	908.3	367.0
2005-07	438.9	1500.0	800.0	353.8	706.3	867.8	696.6	501.3	1013.9	347.5
Change over Periods (%)										
1978/79-1980-84	28.1	40.0	48.6	31.4	11.3	15.4	22.4	9.2	40.0	0.0
1980/84-1985/89	38.4	76.2	34.6	37.1	40.4	48.3	74.7	65.1	114.3	44.5
1990/94-1995/99	41.1	116.2	54.3	31.8	85.6	25.3	60.7	48.2	50.0	47.1
1990/94-1995/99	40.1	117.5	57.4	25.9	79.7	24.8	70.5	68.8	75.6	64.5
1995/99-2000/4	20.2	28.7	45.9	15.7	25.9	74.3	18.8	9.0	15.0	5.0
2000/04-2005/07	4.1	0.4	12.9	2.2	7.6	86.1	0.0	1.9	11.6	-5.3

Source: Table A7.6

It must however, be clarified here that feed demands by other livestock sectors such as (sheep) wool production, bovine milk production besides fisheries (that marginally require grain based products) and draught animals are not taken into account in these estimates. Including the claimants other than meat-producing animals would reduce the conversion ratios even further for the entire period. As pointed out in Chapter 4, in integrated agricultural systems, grain is an important part of feed though not the only component. The ecological conditions and environmental parameters of China provide a larger set of feed types – grasslands, fodder crops besides many varieties of plant species – that substantially reduce feed grain demand. In addition, the traditional practice of utilizing crop residues, as part of livestock feed has been fundamental and an expansion of farm output by itself creates possibilities for expanding livestock. However, the emergence of specialized production units as well as modern commercial livestock production complexes in the post-1978 reforms

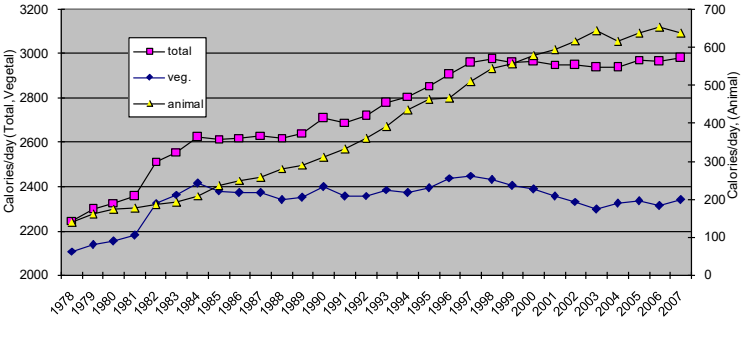
period did lay claim to a growing proportion of grain for feed. The fundamental issue of food versus feed in post-reform Chinese agriculture and the issues concerning access to food under conditions of an increasing unequal distribution of income will be discussed following an examination of the trends in total nutrition and its components.

7.3 TRENDS IN NUTRITION 1978-2007

Changes in the composition of diet brought about by variations in the direct and indirect components of food grain demand translates into changes in the availability of the three components of nutrition – energy (calories), protein and fat. Further, an increase/decrease in the availability of other items of food such as vegetables and fruits directly alters the supply of micronutrients in the form of various types of vitamins that are vital to reduce the incidence of morbidity. The decline in the availability of food grains per capita and the consequent increase in the quantities of animal products therefore had a significant effect on the per capita nutritional profile revealed in Charts 7.4 and 7.5 for the period 1978-2007. Total energy supply per capita increased rapidly from 2247 kilo calories (Kcal) to 2624 Kcal during 1978-1984 and grew at a slower pace until 1998 to attain a peak level of close to 3000 Kcal but subsequently fell until 2004. The increase thereafter was marginal.

In effect, from 1998 onwards until 2007, there was almost a stagnation explained by a more than rapid decline in energy supply from vegetal sources but only a gradual increase from animal sources. But vegetal sources remained predominant as regards energy supply, though there was a gradual decline in their share from close to 94 per cent in 1978 to about 79 per cent on average during the 2000s (Table 7.3a).

Chart 7.4 China: Sources of Total energy per capita, 1978-2007



Source: Table A7.7

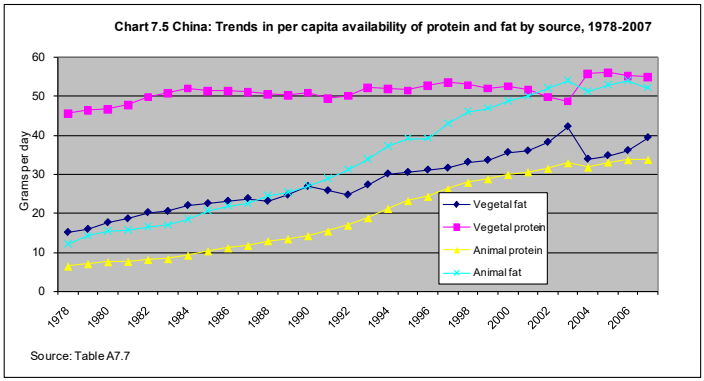


Table 7.3a: China: Availability Per Capita of Energy, Protein and Fat by Sources, 1978-2007

	Calories/Cap/Day (Number)			Protein/Cap/Day (Grams)			Fat/Cap/Day (Grams)		
	Total	**Veg.**	**Animal**	**Total**	**Veg.**	**Animal**	**Total**	**Veg.**	**Animal**
1978-79	2272	2123	150	52.9	46.1	6.8	28.6	15.5	13.2
1980-84	2476	2288	188	57.7	49.5	8.2	36.4	19.8	16.6
1985-89	2627	2363	263	63.0	51.0	12.0	46.4	23.4	23.0
1990-94	2742	2375	366	68.4	51.0	17.4	58.6	27.0	31.7
1995-99	2932	2424	509	78.8	52.7	26.2	74.9	32.0	42.9
2000-04	2951	2340	611	83.2	51.8	31.4	88.4	37.2	51.3
2005-07	2974	2330	644	89.1	55.5	33.6	89.9	36.8	53.1
Indices									
	Cal/Cap/Day (Number)			**Prot/Cap/Day (Gr)**			**Fat/Cap/Day (Gr)**		
	Total	**Veg.**	**Animal**	**Total**	**Veg.**	**Animal**	**Total**	**Veg.**	**Animal**
1978-79	100	100	100	100.0	100.0	100.0	100.0	100.0	100.0
1980-84	109.0	107.8	125.2	109.2	107.4	121.2	127.3	127.6	126.4
1985-89	115.6	111.3	175.3	119.2	110.7	176.2	162.3	151.2	174.9
1990-94	120.7	111.9	244.1	129.3	110.7	255.9	204.9	173.9	240.9
1995-99	129.1	114.2	339.1	149.2	114.4	385.0	262.0	206.3	326.5
2000-04	129.9	110.2	407.2	157.5	112.4	462.4	309.2	239.9	390.0
2005-07	130.9	109.8	429.3	168.7	120.5	494.6	314.3	237.2	404.1
		Energy shares			**Protein Shares**			**Fat Shares**	
		Veg.	**Animal**		**Veg.**	**Animal**		**Veg.**	**Animal**
1978-79		0.934	0.066		0.871	0.129		0.543	0.459
1980-84		0.924	0.076		0.858	0.143		0.543	0.457
1985-89		0.900	0.100		0.810	0.190		0.506	0.495
1990-94		0.867	0.133		0.747	0.253		0.461	0.539
1995-99		0.827	0.173		0.668	0.332		0.427	0.573
2000-04		0.793	0.207		0.622	0.378		0.420	0.580
2005-07		0.783	0.217		0.623	0.377		0.409	0.591

Source: Table A7.7

As regards protein and fat availability, the share of vegetal sources fell more rapidly though they still accounted for an average of 62.5 per cent during 2004-07, falling from over 87 per cent in 1978. The shares of vegetal and animal sources in total fat availability per capita were reversed over the entire period – from roughly 55 per cent and 45 per cent in 1978. Table 7.b presents the share of vegetal sources of energy by various components and Table 7.3c, the shares of fat and protein from these sources.

Table 7.3b: China: Sources of Total Energy Per Capita by Components (%)

	Cereals	Tubers	Pulses	Veg.Oils	Sugar	Total	
						Vegetal	Animal
1978	69.2	12.9	2.0	2.6	1.7	93.8	6.2
1979	70.4	10.8	2.0	2.8	1.8	93.0	7.0
1980	69.0	10.3	2.0	3.3	2.1	92.5	7.5
1981	69.8	9.2	1.8	3.5	2.0	92.5	7.5
1982	70.1	8.8	1.6	3.7	2.4	92.6	7.4
1983	70.4	8.6	1.4	3.8	2.2	92.5	7.5
1984	70.2	7.8	1.4	4.0	2.3	92.0	8.0
1985	69.7	6.5	1.3	4.1	2.6	91.0	9.0
1986	68.9	6.3	1.1	4.3	2.4	90.5	9.5
1987	67.5	6.5	1.0	4.5	2.6	90.2	9.8
1988	66.7	5.9	1.0	4.4	3.0	89.3	10.7
1989	66.9	5.8	0.9	5.0	2.5	88.9	11.0
1990	66.2	5.6	0.7	5.5	2.7	88.6	11.4
1991	65.6	5.4	0.6	5.3	2.9	87.6	12.3
1992	65.1	5.5	0.4	4.9	2.5	86.7	13.3
1993	63.0	5.6	0.5	5.2	1.8	85.9	14.1
1994	60.5	5.3	0.5	6.0	2.0	84.5	15.5
1995	59.0	5.3	0.5	6.0	2.3	83.8	16.2
1996	58.9	5.5	0.5	6.1	2.5	83.9	16.1
1997	57.2	5.3	0.4	6.0	2.8	82.8	17.3
1998	55.9	5.6	0.5	6.2	2.7	81.7	18.3
1999	55.3	5.9	0.4	6.5	2.1	81.2	18.8
2000	53.5	5.9	0.4	6.8	2.0	80.5	19.5
2001	51.7	5.9	0.4	7.0	2.1	79.9	20.1
2002	49.4	6.5	0.4	7.8	2.2	79.1	20.9
2003	47.0	6.0	0.4	9.3	2.5	78.1	21.9
2004	50.8	6.4	0.4	6.1	2.0	79.0	21.0
2005	50.0	6.3	0.4	6.2	2.1	78.5	21.5
2006	49.9	5.0	0.4	6.7	2.1	78.0	22.0
2007	48.9	4.8	0.4	7.7	2.7	78.6	21.4

Source: FAO-SUA

Table 7.3c: China: Sources of Protein and Fat Per Capita, 1978-2007

	Protein (proportions)			Fat (proportions)		
	Vegetal	Animal	Cereals	Vegetal	Animal	Pork
1978	0.875	0.125	0.643	0.555	0.445	0.301
1979	0.868	0.132	0.647	0.530	0.473	0.333
1980	0.860	0.140	0.643	0.532	0.468	0.332
1981	0.861	0.139	0.647	0.541	0.456	0.331
1982	0.859	0.141	0.657	0.550	0.450	0.327
1983	0.858	0.142	0.661	0.547	0.453	0.325
1984	0.850	0.152	0.656	0.545	0.455	0.327
1985	0.832	0.168	0.644	0.522	0.480	0.346
1986	0.820	0.178	0.629	0.513	0.487	0.353
1987	0.811	0.187	0.617	0.514	0.486	0.346
1988	0.797	0.205	0.603	0.485	0.515	0.363
1989	0.789	0.211	0.607	0.493	0.507	0.357
1990	0.781	0.219	0.602	0.499	0.501	0.351
1991	0.763	0.238	0.594	0.473	0.529	0.368
1992	0.748	0.253	0.577	0.442	0.560	0.383
1993	0.734	0.266	0.540	0.446	0.554	0.374
1994	0.709	0.291	0.508	0.447	0.553	0.368
1995	0.688	0.311	0.491	0.437	0.563	0.360
1996	0.684	0.316	0.485	0.442	0.558	0.349
1997	0.671	0.329	0.463	0.422	0.576	0.369
1998	0.654	0.346	0.449	0.419	0.582	0.373
1999	0.644	0.357	0.441	0.417	0.583	0.364
2000	0.637	0.363	0.417	0.422	0.578	0.358
2001	0.628	0.373	0.405	0.419	0.583	0.362
2002	0.612	0.388	0.387	0.423	0.577	0.352
2003	0.597	0.403	0.364	0.438	0.562	0.342
2004	0.636	0.363	0.417	0.398	0.602	0.370
2005	0.629	0.371	0.406	0.396	0.604	0.374
2006	0.621	0.379	0.405	0.400	0.600	0.368
2007	0.619	0.381	0.399	0.430	0.570	0.334

Source: FAO-SUA

By 1978, even before formal reforms were initiated, the nutritional status on a per capita basis was already above the required or recommended levels in all three dimensions. Post-1978, the increase in protein and fat availability expanded much faster than that of energy supplies. Additionally the large increases in availability of vegetables and fruits point to vast improvements in micro nutrient availability too. This is consistent with observed empirical regularities over the long term in the case of industrialized countries, explained by behavioral changes in consumption preferences following growth in incomes. But when growth in incomes is accompanied by changes in the distribution of income across groups, the per capita supplies of various food categories may not truly represent nutritional status of those groups.

The next section takes this up as part of the broader issue of food versus feed under conditions of rapid income growth.

7.4. FOOD VERSUS FEED

The increasing share of grains diverted to feed and the more than proportionate increase in the production of animal products, presents a problem of a statistical as well as a *real* reconciliation between the two that is resolved by the rapid fall in conversion rates shown in Chart 7.3. The problem is exacerbated if two other factors are taken into account. The first concerns the existence of draught animals in considerable numbers (though declining over the period) and the demands on grain as feed from other livestock sectors such as wool and milk production and fishery. Fishery would not be a claimant to feed if it were restricted to harvesting from the sea, unless artificial breeding and production increasingly become significant, which has been the case in China since the mid-1990s. The other factor concerns changes in the technological aspect of animal husbandry. An increasing share of total output of animal products originating from modern specialized production centres located in suburban districts, to cater to urban demand as opposed to household livestock raising (in other words integrated with agriculture), is more likely to exert an upward pressure on feed grain demand due to its higher feed conversion ratios.

While official data displaying high levels and rapid growth of meat production may itself be open to question, the problem regarding compatibility of feed grain supply and meat production may appear less valid if other forms of animal feed are taken into consideration. Table A7.8 presents a set of data that includes the component "waste and other uses" from the supply and utilization tables of the FAO. Table 7.4a presents these as a share of domestic supply.

Table 7.4a: China: Share of Additional Feed in Domestic Supply, 1978-2007 (%)

	Cereals	Starch Roots	Food Grains	Oilcrops	Fruits	Vegetables
1978	5.0	5.1	5.0	7.9	8.5	7.7
1979	5.1	5.1	5.1	8.0	8.5	7.8
1980	5.1	5.2	5.1	7.3	8.2	7.8
1981	5.0	5.3	5.0	7.0	8.1	7.8
1982	5.2	5.3	5.2	7.5	7.9	7.9
1983	5.9	5.3	5.6	7.3	7.9	8.0
1984	5.7	5.4	5.6	7.6	7.6	8.2
1985	5.1	5.4	5.2	6.9	7.6	8.3
1986	5.2	5.5	5.3	7.2	7.3	8.5
1987	5.4	5.7	5.4	7.4	7.4	8.5

	Cereals	Starch Roots	Food Grains	Oilcrops	Fruits	Vegetables
1988	5.4	5.7	5.5	6.0	7.5	8.6
1989	5.9	5.5	5.8	6.2	6.9	8.5
1990	6.2	5.7	6.1	5.6	6.7	8.4
1991	6.1	5.9	6.0	5.4	6.5	8.3
1992	6.7	5.8	6.5	6.1	7.0	8.4
1993	6.7	5.8	6.4	3.8	7.1	8.4
1994	7.0	5.8	6.6	3.7	7.2	8.3
1995	6.7	5.6	6.4	5.0	7.3	8.2
1996	6.7	6.0	6.5	4.4	7.4	8.2
1997	6.4	6.0	6.2	4.3	7.3	8.2
1998	6.6	5.8	6.3	3.4	7.5	8.2
1999	6.7	6.1	6.5	3.6	7.4	8.2
2000	6.2	6.1	6.2	3.5	7.6	8.2
2001	6.0	6.1	6.0	3.5	7.4	8.3
2002	5.8	6.5	6.1	3.0	7.3	8.2
2003	5.6	7.1	6.2	3.4	7.1	8.2
2004	10.3	7.5	9.3	3.2	7.0	8.1
2005	10.3	6.9	9.1	2.9	7.1	8.1
2006	11.2	8.2	10.3	2.7	7.0	8.1
2007	11.6	7.4	10.3	2.8	7.1	8.1

Source: Table A7.8

Clearly, an additional 10 million tons of food grains was available as feed in 2006-07 compared to about half that level in 1978. This translates into over 10 per cent of domestic supply during 2004-07, bringing the potential feed availability to over 40 per cent of domestic supply. While in the case of sugar crops, there is no waste and other uses reported (though there are figures available as feed), all three components are reported for oil crops. It is normal practice in traditional agriculture integrated with livestock production, to make available the entire oil crop residue after the extraction of oil for animal consumption usually in the form of oil cakes, which form an important source of protein and fat for livestock. Thus besides feeding part of the domestic supply of oil crops as feed, the entire residue is also available for the same use. From both the tables it can be seen that the recoverable portion (as feed) was over 60 million tons during 2004-07 rising from 16 million tons in 1978.

While these data on potential additional feed availability point to a downward bias in FAO data on feed (for various crops) since the actual diversion may be significantly higher, a broader definition of feed would include many other components. Important among these are crop residues –straw, stalks etc – that enter into composite feed and their volumes are directly proportional to farm output. Qin and Tian (2000) report that close to a third of these residues enter into feed production amounting to about 180 million tons in the early 1990s. Besides crop residues, there is the

category of 'Non-conventional feed resources' (NCFR) that include green manure crops and Leucaena, a tropical legume that is extensively found in southern China and used as feed.[4] Wool producing sheep are reared more extensively in regions that are endowed with grasslands, where the dependence on grain feed is perhaps minimal. Further, pig-raising at the household level practiced as a sideline activity, is predominant in terms of output, by utilizing crop by-products and household food waste in combination with grain and other food products much more efficiently than the modern meat production sector. All these factors buttress the argument that an expansion of the livestock sector can be achieved by a less than proportionate increase in indirect feed demand under certain conditions. But this resolves the problem only partly, as the real question would be whether increases in average availability of meat translate into lower than required average levels of direct grain supply for some sections of the population. This forms the basis of the problem of food versus feed, to which the discussion now turns.

Revisiting Chart 7.2, it is clear that after 1996, with an all time peak in the per capita availability of total food grains of 309 kgs, there was a fall in all the three variables – total, direct and indirect availability – up to 2003, when the lowest total availability was recorded. The direct availability however had been declining since 1984 after reaching a peak of 233 kgs. As Table A7.1 shows, during 1995 and 1996, net exports were to the tune of 27.7 and 17.4 million tons respectively and the sudden increase in total availability – of 18.6 kgs per capita in 1995 - was accompanied by a further reduction in direct availability by 1.6 kgs and 20.6 kgs per capita which was being diverted to feed. During 2004-07, while the addition to total availability per capita was 18.2 kgs, the additions to feed per capita was 23.5 kgs, the balance 5.3 kgs being the net reduction in per capita availability of direct food grain availability.

The official view in this regard has been to interpret the changing composition of food – increasing meat consumption and a corresponding decline in direct consumption of food grains – as an attainment of 'nutritional prosperity', signaling the onset of a prosperous stage in overall economic development. Official statistical representation of prosperity (or at the least nutritional well being) has taken the form of an annual data series on Engel's coefficient for both rural and urban China.[5] Expressed as a ratio of total living (consumption) expenditure, the share of food declined from 67.7 per cent in 1978 to 41 per cent in 2009 for rural China, while the

4 See China's Livestock Industry (1995) for a detailed study of NCFR.

5 Engel's law states that as household income increases beyond a certain level, the share of food expenditure begins to fall even though the absolute expenditure on food may increase. Just as for an individual, for a society too with increases in per capita GDP, Engel's law begins to operate and such a stage has been interpreted as the onset of 'prosperity'.

corresponding decline for urban residents was from 57.5 per cent to 36.5 per cent in the respective years.

This can be interpreted in two ways. Income growth far outstripped the share that is required to meet food expenditure, leaving an increasing share for other expenditure, which corresponds to the basic idea of Engel's law. The other inference that can be drawn is that expenditure to meet needs other than food had become overwhelmingly high, resulting in compressing food expenditures substantially. The former would represent improvements in food consumption and nutrition only if the reducing share in total expenditures also expanded the absolute quantity of food consumed, while for the latter it would suffice if the relative decline of food expenditure also reduced food availability. These inferences are conditional upon other factors such as food supplies, changes in behavioral parameters besides the initial level and composition of food consumed. More important in this regard are changes in the distribution of income between different classes and their effect on the volume of food consumption and its composition.

One of the earliest theoretical elaborations and clarification in this regard is found in Yotopoulos (1985). The conventional formulation of demand for food as a function of population and income, where an increase in demand is proportional to that of population and less than proportional to changes in income (due to the operation of Engels' law), seeks to explain the growth of food demand mainly on the basis of population growth. According to this line of reasoning, population growth becomes the central cause for the emergence of food crises, famines or malnourishment. Yotopoulos points to three fallacies that underlie the conventional formulation arising from problems of aggregation. First, food as an aggregate category is actually a set of commodities, thus the growth of food consumption is owing to differential growth in these commodities. Secondly, the combination of food commodities and the elasticity of demand changes at different levels of income – therefore the income elasticity is different across income categories. Thirdly, since population is a non-homogenous variable, changes in food demand depend on which income classes grow in size and by what quantum.

In order to examine the interactions between income and population growth in demand for food, Yotopoulos (1985) used international cross-section data on cereal demand for the period 1966-80. Of the total global demand for cereals in 1980, direct consumption as food and indirect consumption in the form of meat (animal protein and fat) had respective shares of 47 and 39 per cent (the reminder disappearing in the form of waste, seed and other uses). A disaggregated picture revealed that developed market and erstwhile centrally planned economies with 26 per cent of

world population together accounted for 83 per cent of feed demand equivalent to 467 million mt that almost equaled the direct consumption by the remaining 74 per cent of the world population. The direct component for the two sets of countries was however proportionate to their population. In the case of the middle-income developing countries, of the total of a little over 200 million mt, direct consumption accounted for 60 per cent and the remainder accounted as feed.

Figure 7.1 is a stylistic representation of the basic hypothesis with regard to changes in direct and indirect consumption of food grains that accompanies income growth in a growing economy. The direct demand rises initially with the growth in income per capita and after a point of saturation, falls at higher income levels. The indirect component of total demand rises more steeply, as the consumption per capita of animal products rises, so as to offset the fall in direct demand. In the case of developed economies (including the centrally planned), the saturation point seems to have been at a level just below 200kgs per capita whereas indirect consumption in 1980 stood at close to 550 kgs per capita in Western Europe and 850 kgs per capita in the United States.[6] For the middle-income developing countries, high growth rates of feed were observed, which was however accompanied by increases in direct consumption of cereals owing to population growth as well as reducing the absolute number of the malnourished.

Apart from feed demand, which is the major component, indirect demand also includes cereals processed into value-added products and manufactures like alcohol. At the time that Yotopoulos was writing in 1985, the use of grains and other foods like sugarcane for producing fuel was not important, but today we would have to include this element which has further aggravated the food security of poor populations by substantial reduction of grain stocks on the global market available for import.

In the case of the Less Developed Countries (LDC's), Yotopoulos found that the income elasticity for feed demand[7] was much higher than that for food (direct consumption). In the particular case of Africa, feed demand increased proportionately with income and food demand remained static, resulting in a reduction of total cereal availability at the rate of 0.3 per cent p.a. This illustrates the case where a shortfall in per capita supply is not proportionately shared between food and feed. "On the contrary, when feed use increases, food use is crowded out, resulting in negative income elasticity of demand".

6 Estimates of growth rates of the two components for the period 1966-80 also confirm the hypothesis. For the developed countries the rate for direct demand was below 1%, where as that for cereal feed demand was 2.7%. See Yotopoulos (1985) Table 1 & 2.

7 Income elasticity is estimated assuming an elasticity of demand for cereals with respect to population at 1,.

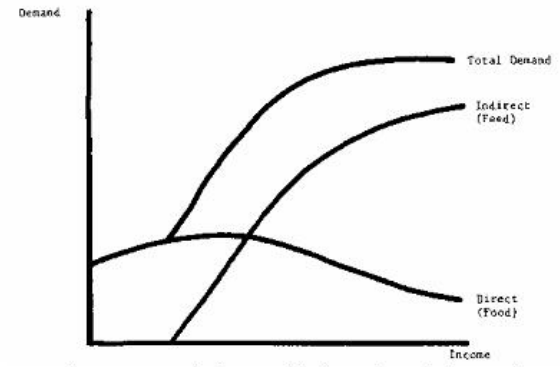


Figure 7.1. Total, direct and indirect demand for cereals
(Source: Yotopoulos PA, 1985)

Without further background information on the nutritional content of animal products and the feed coefficients required to produce them, it may not still be very clear why in the Yotopoulos diagram, indirect demand increases much faster than the decline in direct demand, such that total demand rises steeply with rising income. Once we understand first, that animal products are weight for weight poor sources of energy compared to grains, and second, substantial weights of grain are required for conversion to animal products, the nature of the behavior of total grain demand as income rises, becomes clearer. For illustrative purposes the energy and protein content of one kilogram of milk/ chicken, pork, and beef are compared below with the energy and protein content of the grain required as feed to produce these items, if that grain was directly consumed instead of being used as feed. The illustration is taken from Patnaik (2009) (Table 7.4).

Table 7.4: Loss/Gain of Energy and Protein in Converting Feed Grain to Meat

	Energy (Kilocalories)	**Protein (Grams)**
1 kg Chicken/Eggs gives ggprovides provides prrprovides Requires	1,090	259
Requires 2kgs feed	6900	200
1 kg Pork gives Requires	1180	187
Requires 3 kgs feed grain	10,350	300
1 Kg Beef gives	1140	226
Requires 7 kgs feed grain	24150	700

Source: Patnaik (2009)

Though consumers prefer animal products like milk, eggs and meat as their incomes rise, the opportunity cost of consuming them in nutritional terms is very high. A kilogram of grain on average provides 3,450 Kcal energy when directly consumed, and about 100 gms protein. But a kilogram of eggs/chicken provides only 1,090 kilocalories of energy – though a much higher protein intake.

If a consumer who is getting better off, reduces one kilogram of grain directly consumed say over one week and substitutes it by eggs or chicken, but wishes to maintain the same energy intake as before, then 3.2 kg eggs/chicken would be required to maintain 3,450 calories, entailing a feed grain demand of 6.4 kg. This feed grain if directly consumed as food, would have given 22,080 calories energy and 640 gms protein. Even if the well-to-do consumer puts up with halving his energy intake over the week in order to diversify his diet, the 1.6 kg chicken/eggs consumed would still entail a derived grain demand of 3.2 kgs, over three times higher than direct consumption of one kilogram grain in the initial state.

Thus if average incomes are rising (without much change in income distribution) then the rising feed grain demand would indeed tend to far outweigh the fall in direct demand, producing the steeply rising curve of total demand per capita depicted in the Yotopoulos diagram. The danger arises if in the process of growth, income distribution itself becomes much more concentrated and grain output growth is insufficient, for then the superior purchasing power of a minority of consumers getting rich can result in diverting more and more grain to indirect uses at the expense of lower availability for direct consumption by the poor, who are in effect outcompeted from the foodgrain market. In such a case, diversification can take place within a falling per capita domestic supply entailing adverse nutritional outcomes for the majority. Patnaik (2010) argues that such a process underlies the observed decline in Indian per capita domestic grain supply/ demand. Hence the observed decline in average calorie and protein intake from already low levels, over the economic reforms period, despite the fact that per capita income has been rising fast.

The data on broad country categories as well as the use of average per capita incomes for individual countries are also aggregations at different levels and therefore suffer from the problems of aggregations referred to earlier. More relevant to the discussion on China would be the experience of middle-income countries where growth in incomes and employment, besides lifting people out of poverty, also results in the 'graduation' of lower income group into the middle-income class, thereby enlarging it. The food-feed dynamics then assumes a slightly different form. Yotopoulos examines the case of Tunisia in 1975 with data on population disaggregated by income classes and the respective quantities of consumption of direct and indirect cereals and

finds the income elasticity of feed demand for the middle-income group to be much higher than that for the upper-income class. Though the average feed demand for the country as a whole was only 50 kgs per capita, the respective levels for the lowest, the middle and the upper income groups were 25 kgs, 58 kgs and 106 kgs. The average direct absorption of cereals was however, 150 kgs for all the classes perhaps reflecting a system where the food-feed competition was stable.

In the final analysis, economic development and income growth that entails expanding middle-income classes has the potential to 'crowd-out' direct food consumption of the poor via higher income elasticity for indirect demand. The increasing role of markets in an integrated global economy has a further potential to shift the 'crowding out' effect across countries and continents.

Examining the case of India, Patnaik (2007) found that even in the case when the food-feed tussle is not of an order to threaten substantially the direct demand of the lower income group, mere stagnation of incomes or even declines in disposable incomes of this group, in the absence of minimum food-entitlement policies under a regime of a liberalized economy, can compress direct demand for food grains. In a debate on poverty in India[8], responding to the Indian Government's claims of significant reductions of population below the poverty norm since the early 1990s, Patnaik (Ibid) estimated that between 1993-94 and 2004-05, the proportion of rural population spending (on food) below the level required to attain the minimum norm of 2400 calories rose from 74.5 per cent to 87 per cent. The corresponding figures for a norm of 2200 calories in the same period was 58.5 per cent to 69.5 per cent while that for a norm of 1800 calories rose from 20 per cent to 25 per cent. Using a similar procedure combining the calorific norm with the minimum necessary expenditure that ensures its attainment, Patnaik (2010a) showed that in the same period, urban poverty in India followed a similar trend with the proportion of the urban population (consuming below 2400 k calories) rising from 57 per cent in 1993-94 to 64.5 per cent in 2004-05.

The availability of cereals per capita in India (according to FAO data) fell from about 170 kgs in 1989 to 150 kgs in 2004, marginally increasing to 152.6 in 2007. Deaton and Dreze (2005) argued that income increases led to the decline in consumption of cereals per capita and this reflected only a diversification of diets where cereals were substituted for other 'superior' food items such as vegetables, milk, fruit etc. Diversification of cereal use did occur with feed accounting for 0.5 kgs per capita in 1989 to over 7.4 kgs per capita in 2004 and 8.5 kgs in 2007, but the diversification of diets did not reflect in increased per capita calorie availability

8 See Deaton &Kozel (ed.) (2005) for a collection of literature on this debate.

from all food sources that a 'substitution' of cereals would normally entail. Instead, per capita calorie availability per day on average fell from 2417 in 1989 to 2340 in 2004. Patnaik (2010) discusses the fallacies (of a different order from that noted by Yotopoulos) that underlay the reasoning in Dreze and Deaton (2005 & 2009), that ignores the fact that a higher income elasticity of demand for indirect consumption does not mean a reduction in direct demand to compensate for the diversion towards feed. Rather, the sum of direct and indirect demand should rise for the income effect to manifest. But the data shows a net reduction in total availability (both indirect and direct) of cereals from 170.5 kgs in 1989 to 157.3 kgs in 2004. The second fallacy in this regard arises from the disaggregation problem noted earlier. The decline in average direct and total availability of cereals per capita, with a corresponding increase in feed (indirect) per capita,implies a squeeze in direct availability for the poorer income groups. The demand for cereals to feed animals to produce 'superior' food items for the wealthier income groups, thereby reducing average availability, appears very similar to the case of Africa discussed in Yotopoulos.

7.5 INCOME DISTRIBUTION AND NUTRITION IN POST-1978 REFORM CHINA

Turning to an evaluation of the food-feed dynamics in China, it is clearly evident from the data that net declines in total availability of food grains (as a broader category including starchy roots and pulses) began in 1985 and continued up to 1994. Substantial imports in 1995 and 1996 boosted the total availability mainly to expand feed and not direct availability. The decline continued post-1996 until 2003 - the year with the lowest levels of total as well as direct availability of food grains since the 1978 reforms. More importantly, in 2003, the net export of grain was 11.6 million tons, largely made up of maize (11.4 million tons). Though the situation was reversed in 2004, with a net import of 7.2 million tons of wheat and 2.5 million tons of maize, the diversion toward feed was 98.8 million MT - 24.2 million tons in excess of the 2003 levels.

From the discussion earlier in this section, the feed-food balance in China seems to be following a pattern such that income growth is driving indirect demand, which is compensated by a squeeze in direct demand (from 1985 onwards). This does not point to a stable or sustainable situation. Whether there is a squeeze in availability for the lower income groups in order to satiate indirect demand of a growing middle and upper class requires a particular set of empirical information. Data from surveys on living conditions of rural and urban households provides some information on food expenditures and consumption of various categories of food items by income

classes. Before examining the intra-urban and intra-rural situation with regard to food consumption, the rural versus the urban question is taken up first.

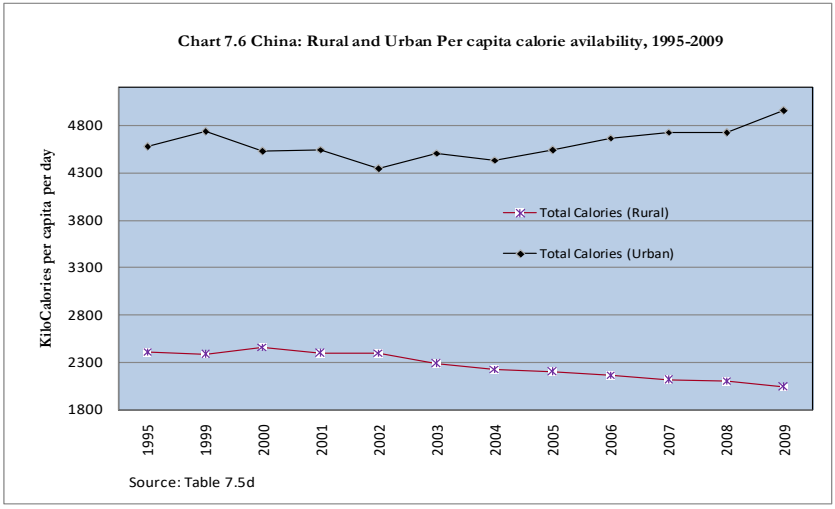
7.5a Rural Urban differentials in Food Consumption and Nutrition

The real evolution of the competition for food between different income groups in general appears to have emerged between the rural and the urban populations. The intensity of the food versus feed problem simultaneously emerges from data on per capita consumption of grain and meat in rural and urban areas. Table 7.5a presents National Bureau of Statistics survey data on consumption of various foods in rural and urban areas. The rural data is denoted as 'consumption, whereas the urban data relates to purchases of various food items which implies that some food is consumed outside of home. Fuller et al (2000) examined the meat purchases data for urban residents and consumption data for rural residents and estimated a shortfall of 40 per cent between official reported meat production and total consumption. The consumption away from home according to their estimate could not amount to more than 10 per cent of this shortfall and given inadequate storage facilities for meat in China, accumulation of stocks cannot account for the remainder of the shortfall. They conclude that meat production statistics are biased significantly upward. The FAO data used here is about 15 per cent lower than official estimates. This problem however, does not affect a comparison of consumption figures of urban and rural residents.

Data in table 7.5a appears consistent with the food balances statistics between direct consumption of grains and indirect consumption in the form of meat. The higher meat consumption by urban households is compensated for by a significantly smaller quantity of grain, whereas for the rural households, the relatively lower meat consumption per capita is compensated for by significantly higher grain consumption per capita. The data in this table is however incomplete as the urban figures relate to only purchases of basic food items and understates total consumption that includes food consumed away from home. Thus the evidence is not convincing to accept such a line of thinking.

The ratio of rural to urban consumption of the items is provided in Table 7.5b. Clearly, rural residents have no advantage in consumption over urban residents in any of the food other than grain with consumption levels that are 2 to 3 times urban purchases over the period 1990-2009. As regards 'superior' or 'high-protein' food such as meat, milk and eggs, the per capita rural consumption lags by wide margins except in the case of vegetables, edible oil and pork where the ratios are over 70 per cent on average. In the case of fruits, the average is only 15 per cent in the entire period though marginal improvements seem to have occurred during 2007-09.

A better understanding of relative levels of consumption is possible only if grain consumption for urban residents could be estimated. Official data provides grain production figures from which domestic supply to account for trade and the food component can be estimated using the ratios in FAO's supply and utilization accounts. This divided by the population gives the per capita supply of food grains according to the official definition that includes tubers (1/5th by weight), soybeans and other minor grains. Since rural per capita consumption data is available for wheat and rice, consumption of other grains can be estimated as a residual. An alternate procedure would be to directly use FAO per capita supply figures for grain (including all the components according to the official definition) and deduct the rural per capita component weighted by rural population and estimate the urban per capita consumption for grain. The former procedure is used in the estimates here for grain and its components.



The latter procedure is used to estimate urban consumption per capita for all other food items in Table 7.5a under rural consumption. Table 7.5c is the result of such an exercise providing a more accurate estimate of urban consumption. The ratio of urban to rural consumption is calculated and presented in the same table. The results are striking, showing urban direct consumption levels of total grains, rice and wheat almost equal to the rural levels. Other grains account for a very small proportion of total grains and in this category the rural levels are higher. Except in the case of pork consumption, where the ratios of urban consumption is at the most 3 times rural levels (in just one year) but on average about 1.7 times the rural

level, in all other components of superior food, urban consumption levels are far higher – several times the rural levels. Clearly, at the aggregate level there has been a tradeoff between grain and meat – or food for feed – but in urban China, though marginal reductions in per capita grain is seen from 2000 onwards, by 2007 it is higher than the rural levels in addition to much higher levels of meat, eggs, milk and fruit consumption.

Table 7.5a: China: Rural Consumption and Urban Purchases of Food, 1990-2009, Kgs

	Rural Per Capita Consumption												
	1990	**1995**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Grain*	262.1	256.1	247.5	250.2	238.6	236.5	222.4	218.3	208.8	205.6	199.5	199.1	189.3
Wheat	80.0	81.1	79.2	80.3	76.8	76.3	73.2	72.4	68.4	66.1	64.4	62.7	59.6
Other grain	47.1	43.5	43.9	40.6	36.5	34.9	27.9	26.6	25.1	25.5	24.0	23.6	22.3
Rice	135.0	129.2	121.6	126.8	122.9	123.1	119.3	117.4	113.4	111.9	109.4	111.0	105.7
Soybeans		2.3	2.7	2.5	2.5	2.2	2.1	1.9	1.9	2.1	1.7	1.8	1.7
Vegetables	134.0	104.6	108.9	106.7	109.3	110.6	107.4	106.6	102.3	100.5	99.0	99.7	98.4
Edible Oil	5.2	5.8	6.2	7.1	7.0	7.5	6.3	5.3	6.0	5.8	6.0	6.3	6.3
Pork	10.5	10.6	12.7	13.3	13.4	13.7	13.8	13.5	15.6	15.5	13.4	12.7	14.0
Beef and Mutton	0.8	0.7	1.2	1.1	1.2	1.2	1.3	1.3	1.5	1.6	1.5	1.3	1.4
Poultry	1.3	1.8	2.5	2.8	2.9	2.9	3.2	3.1	3.7	3.5	3.9	4.4	4.3
Eggs	2.4	3.2	4.3	4.8	4.7	4.7	4.8	4.6	4.7	5.0	4.7	5.4	5.3
Milk	1.1	0.6		1.1	1.2	1.2	1.7	2.0	2.9	3.1	3.5	3.4	3.6
Aquatic Products	2.1	3.4	3.8	3.9	4.1	4.4	4.7	4.5	4.9	5.0	5.4	5.2	5.3
Sugar	1.5	1.3	1.5	1.3	1.4	1.6	1.2	1.1	1.1	1.1	1.1	1.1	1.1
Fruits	5.9	13.0	18.4	18.3	20.3	18.8	17.5	17.0	17.2	19.1	19.4	19.4	20.5
Nuts &Kernels		0.1	1.8	0.7	0.8	0.8	0.7	0.7	0.8	0.9	1.0	0.9	1.1
	Urban Per Capita purchases												
Grain	130.7	97.0	84.9	82.3	79.7	78.5	79.5	78.2	77.0	75.9	77.6		81.3
Vegetables	138.7	116.5	114.9	114.7	115.9	116.5	118.3	122.3	118.6	117.6	117.8	123.2	120.5
Edible Oil	6.4	7.1	7.8	8.2	8.1	8.5	9.2	9.3	9.3	9.4	9.6	10.3	9.7
Pork	18.5	17.2	16.9	16.7	16.0	20.3	20.4	19.2	20.2	20.0	18.2	19.3	20.5
Beef & Mutton	3.3	2.4	3.1	3.3	3.2	3.0	3.3	3.7	3.7	3.8	3.9	3.4	3.7
Poultry	3.4	4.0	4.9	5.4	5.3	9.2	9.2	6.4	9.0	8.3	9.7	8.0	10.5
Eggs	7.3	9.7	10.9	11.2	10.4	10.6	11.2	10.4	10.4	10.4	10.3	10.7	10.6
Aquatic Products	7.7	9.2	10.3	11.7	10.3	13.2	13.4	12.5	12.6	13.0	14.2		
Milk	4.6	4.6	7.9	9.9		15.7	18.6	18.8	17.9	18.3	17.8	15.2	14.9
Fruits	41.1	45.0	54.2	57.5		56.5	57.8	56.5	56.7	60.2	59.5	54.5	56.6
Nuts &Kernels	3.2	3.0	3.3	3.3		2.8	2.7	2.9	3.0				

* Grain in unprocessed form and includes tubers (1/5th weight), soybeans. And other grains. Source: *China Statistical Yearbook*, Various Issues

Table 7.5b: China: Ratio of Rural Consumption to Urban Purchases of Food, 1990-2009

	1990	1995	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Grain	2.00	2.64	2.91	3.04	2.99	3.01	2.80	2.79	2.71	2.71	2.57		2.33
Vegetables	0.97	0.90	0.95	0.93	0.94	0.95	0.91	0.87	0.86	0.86	0.84	0.81	0.82
Edible Oil	0.81	0.82	0.79	0.87	0.87	0.88	0.68	0.57	0.65	0.62	0.62	0.61	0.65
Pork	0.57	0.61	0.75	0.79	0.84	0.68	0.67	0.70	0.78	0.77	0.73	0.66	0.68
Beef & Mutton	0.24	0.29	0.38	0.34	0.36	0.39	0.38	0.36	0.40	0.41	0.38	0.38	0.37
Poultry	0.37	0.46	0.50	0.52	0.54	0.31	0.35	0.49	0.41	0.42	0.40	0.55	0.41
Eggs	0.33	0.33	0.39	0.43	0.45	0.44	0.43	0.44	0.45	0.48	0.46	0.51	0.50
Aquatic Products	0.28	0.37	0.37	0.33	0.40	0.33	0.35	0.36	0.39	0.39	0.38		
Milk	0.24	0.13	0.00	0.11		0.08	0.09	0.11	0.16	0.17	0.20	0.23	0.24
Fruits	0.14	0.29	0.34	0.32		0.33	0.30	0.30	0.30	0.32	0.33	0.36	0.36
Nuts &Kernels	0.00	0.04	0.56	0.22		0.28	0.27	0.25	0.27				
Liquor	0.66	0.66	0.73	0.70	0.73	0.82	0.82	0.88	1.08	1.09	1.11		

Source: Calculated from Table 7.5a

Table 7.5c: Estimated Urban Per Capita Consumption of Food, 1990-2007, Kgs

	1990	**1995**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Grain	286.0	238.2	231.6	209.0	207.1	183.6	181.5	183.6	197.0	197.4	199.6	193.4	204.5
Wheat	83.3	74.9	72.8	63.0	67.8	47.9	44.0	65.9	69.7	71.8	71.1	71.9	74.2
Rice	147.8	150.5	156.2	138.9	135.3	122.5	112.4	111.9	117.4	120.3	120.4	115.7	122.4
Soybeans		16.8	9.5	11.0	10.1	7.4	10.3	9.3	10.4	9.4	9.9	7.7	8.3
Other grain	54.9	18.5	7.6	11.6	8.2	16.6	28.1	8.4	12.3	8.0	10.3	8.0	9.8
Vegetables		254.0	361.7	431.9	454.8	477.8	509.8	486.9	494.3	504.3	501.5	572.7	577.2
Edible Oil	8.7	10.3	11.1	10.8	11.2	12.6	18.7	10.1	9.5	11.2	13.6	9.9	11.9
Pork	47.9	66.4	66.8	66.3	66.6	66.1	66.9	62.2	61.2	61.3	56.8	62.0	62.8
Beef & Mutton	5.0	13.1	15.3	15.7	15.6	16.3	17.1	14.9	14.6	14.4	15.1	14.9	15.0
Poultry	9.0	20.7	23.5	24.0	22.6	22.3	22.2	20.3	20.5	21.0	21.5	22.2	22.2
Eggs	17.5	35.9	36.5	36.3	36.5	37.3	38.1	33.6	33.3	31.9	32.9	33.6	33.6
Aquatic Products	37.6	63.4	65.6	64.1	61.7	58.7	55.8	54.6	53.2	52.8	52.4	59.4	60.5
Milk	19.3	25.0		24.6	27.5	32.2	38.4	46.3	51.3	57.5	59.6	58.5	59.8
Sugar	24.2	20.3	16.0	14.3	14.4	14.1	16.9	13.3	13.2	13.2	17.2	14.2	11.4
Fruits	46.1	78.1	91.8	86.5	88.2	91.8	96.9	110.0	111.9	116.4	119.5	123.4	131.6
	Ratio of Urban to Rural Levels (proportions)												
Grain	0.92	1.07	1.07	1.20	1.15	1.29	1.23	1.19	1.06	1.04	1.00	1.03	0.93
Wheat	0.96	1.08	1.09	1.27	1.13	1.59	1.66	1.10	0.98	0.92	0.91	0.87	0.80
Rice	0.91	0.86	0.78	0.91	0.91	1.01	1.06	1.05	0.97	0.93	0.91	0.96	0.86
Soybeans		0.14	0.28	0.23	0.24	0.30	0.20	0.21	0.18	0.22	0.18	0.23	0.20
Other grain	0.86	2.36	5.78	3.52	4.45	2.10	0.99	3.18	2.04	3.18	2.34	2.95	2.28
Vegetables		0.41	0.30	0.25	0.24	0.23	0.21	0.22	0.21	0.20	0.20	0.17	0.17
Edible Oil	0.59	0.56	0.55	0.66	0.63	0.60	0.34	0.52	0.63	0.52	0.44	0.63	0.52
Pork	0.22	0.16	0.19	0.20	0.20	0.21	0.21	0.22	0.26	0.25	0.24	0.20	0.22
Beef & Mutton	0.16	0.05	0.08	0.07	0.07	0.07	0.07	0.09	0.10	0.11	0.10	0.09	0.09

	1990	1995	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Poultry	0.14	0.09	0.11	0.12	0.13	0.13	0.14	0.15	0.18	0.17	0.18	0.20	0.19
Eggs	0.14	0.09	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.16	0.14	0.16	0.16
Aquatic Products	0.06	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.09	0.09
Milk	0.06	0.02		0.04	0.04	0.04	0.04	0.04	0.06	0.05	0.06	0.06	0.06
Sugar	0.06	0.06	0.09	0.09	0.10	0.12	0.07	0.08	0.09	0.08	0.06	0.08	0.09
Fruits	0.13	0.17	0.20	0.21	0.23	0.20	0.18	0.15	0.15	0.16	0.16	0.16	0.16

Source: Estimated from FAO data on supply per capita and rural data in Table 7.5a

Table 7.5d: China: Per Capita Energy Supplies in Rural and Urban China, 1990-2007

	1990	1995	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Rural Calorie Supply Per Capita												
Grain		2041	1959	2013	1940	1927	1846	1820	1748	1721	1683	1670	1588
Wheat	601	609	595	603	577	573	550	544	514	497	484	471	447
Rice	1365	1307	1230	1283	1243	1245	1207	1187	1146	1132	1106	1122	1069
Soybeans		20	24	23	22	20	18	17	17	19	16	16	15
Other grain	105	105	110	104	98	89	71	71	70	74	77	60	57
Vegetables	89	70	72	71	73	74	71	71	68	67	66	66	65
Edible Oil	125	141	150	171	171	183	152	128	146	142	145	152	152
Pork	102	102	123	128	129	133	133	130	151	150	129	122	135
Beef and Mutton	2	2	3	3	3	3	3	4	4	4	4	3	4
Poultry	6	9	12	13	13	14	15	15	17	16	18	20	20
Eggs	10	13	17	19	19	19	20	19	19	20	19	22	22
Milk	3	5	6	6	6	6	7	7	7	7	8	8	8
Aquatic Products	2	1	0	2	2	2	3	4	6	6	7	7	7
Sugar	15	12	14	12	14	16	12	11	11	11	10	11	10
Fruits	7	15	21	21	23	21	20	19	20	22	22	22	23
Total Calories (Rural)		2411	2377	2460	2394	2397	2283	2227	2196	2166	2111	2103	2034
	Urban Calorie Supply Per Capita												
Grain		2290	2233	2008	1989	1710	1633	1732	1836	1861	1866	1799	1895
Wheat	626	562	547	473	509	360	331	495	524	539	534	540	558
Rice	1494	1522	1580	1405	1368	1239	1136	1132	1188	1216	1217	1170	1238
Soybeans		150	85	99	90	66	92	83	93	84	89	69	74
Other grain	185	56	21	31	22	45	74	21	32	21	26	20	25
Vegetables		169	241	287	303	318	339	324	329	336	334	381	384
Edible Oil	211	249	270	261	272	305	453	245	230	272	330	239	290
Pork	463	643	646	642	644	640	647	601	592	593	550	600	607
Beef & Mutton	13	35	41	42	42	44	46	40	39	39	41	40	40
Poultry	42	97	110	113	106	105	104	95	96	99	101	104	104
Eggs	71	146	149	148	149	152	155	137	135	130	134	137	137
Aquatic Products	75	126	130	127	122	116	111	108	106	105	104	118	120
Milk	28	36		36	40	47	56	67	75	83	86	85	87
Fruits	447	758	892	840	857	891	941	1068	1087	1130	1161	1199	1278
Sugar	28	23	18	16	16	16	19	15	15	15	20	16	13
Total Calories (Urban)		4572	4730	4519	4539	4343	4504	4433	4539	4662	4726	4717	4955

Source: Tables 7.5a, 7.5c and FAO-FBS Database

A final exercise is also undertaken to estimate the changes in the calorific attainments with these sets of food consumption. Here the calorific equivalent per unit of a food item is drawn from the FAO data and used to estimate total calories for urban and rural residents and presented in Table 7.5d. The food items in the table account for 95 per cent of total calorie supply per capita from all sources at the aggregate level (China as a whole) in 1990 and 1995. For 1999 and 2000 this figure is 93 per cent and for the remaining years it amounts to 92 per cent. Therefore, the estimates are fully representative of the nutritional status measured in terms of energy supply available for rural and urban China.

Nutrition levels in rural China had already fallen to minimum recommended levels (of 2400 calories) by 2002. From 2003 onwards it fell below the norm and after 2005 it has further deteriorated to below 2200 calories per capita. Table 7.6 clearly reveals the divergence between rural and urban nutrition. Even after making a 7 per cent adjustment for the food items not included in these estimates, the level has clearly fallen below even 2200 calories per capita. Urban levels on the other hand, were double the rural levels until 2004 but since then the rural levels have fallen below half the urban levels. In many ways, the situation in the late 2000s, in terms of level of rural nutrition is similar to 1978, only that this time the trend is declining whereas then it was on an upward movement.

7.5B Income Distribution and access to food in Rural and Urban China

In this last section of this chapter, rural and urban survey data on food consumption, disaggregated by income groups, is examined. For urban China, data relates to food expenditures per capita and purchases per capita of various food items whereas for rural China the data available covers consumption expenditures by various components and income. This exercise is intended to draw conclusions on the trends in disparities across income groups within urban and rural China that directly or indirectly affect food consumption. Rural data by income classes is available for the years 2002-09 and for the period 1999-2009 (with some years missing) in the case of the urban.

As mentioned earlier, for urban households the data relates to purchases of various items of food such as raw grain, vegetables, eggs, meat etc, and therefore understates the actual consumption of these items because of food consumed away from home (restaurants, canteens etc). Besides, data on grain purchases are incomplete and available for only 2003, 2005 and 2006 whereas data on purchases of tubers is not available beyond 2006. Therefore, the exercise is restricted to an examination of purchases across income groups of vegetables, meat excluding poultry, eggs and fish

(up to 2006). Data on per capita annual income and per capita disposable income, as well as expenditure data on food and some of its components by various income classes are available for the years 1995, 2001 and 2003-09. From these two sets of data, the ratios of food purchases and food expenditures across income classes can be calculated. In order to examine disparities across income groups, three ratios are estimated – bottom 10 per cent to top 10 per cent, bottom 20 per cent to top 20 per cent and middle 20 per cent to top 20 per cent.

Table 7.5e: China: Relative Urban Purchases of Food Items Across Income Groups, 1999-2009

	Pork Beef and Mutton (ratios)							
	1999	2001	2003	2005	2006	2007	2008	2009
Bottom 10% / top10%	0.651	0.675	0.709	0.701	0.737	0.613	0.565	0.592
Middle 20% / top 20%	0.865	0.918	0.918	0.944	0.947	0.890	0.875	0.919
Bottom 20% / top 20%	0.695	0.730	0.726	0.709	0.746	0.652	0.598	0.642
	Fresh Vegetables (ratios)							
Bottom 10% / top10%	0.717	0.745	0.840	0.886	0.896	0.767	0.768	0.763
Middle 20% / top 20%	0.868	0.896	0.921	0.982	1.002	0.958	0.962	0.975
Bottom 20% / top 20%	0.770	0.792	0.836	0.863	0.881	0.775	0.780	0.787
	Fresh Eggs (ratios)							
Bottom 10% / top10%	0.702	0.738	0.795	0.764	0.784	0.678	0.703	0.704
Middle 20% / top 20%	0.886	0.939	0.952	0.986	0.993	0.961	0.958	0.955
Bottom 20% / top 20%	0.753	0.786	0.800	0.767	0.775	0.698	0.724	0.731
	Fish (ratios)							
Bottom 10% / top10%	0.607	0.637	0.446	0.454	0.490			
Middle 20% / top 20%	0.848	0.906	0.736	0.750	0.763			
Bottom 20% / top 20%	0.667	0.692	0.500	0.497	0.530			

Source data: China Statistical Yearbook, various years

These ratios are compiled in tables 7.5e and 7.f. It can be clearly seen from table 7.5e, that the ratio of purchases of meat (pork beef and mutton together) of the bottom 10 per cent to the top 10 per cent of households (by income) increased between 1995 and 2006 but declined thereafter. For other food components too, a similar trend can be observed. As regards the ratios of the bottom 20 per cent to the top 20 per cent, the trend is again similar. It is interesting to observe the position of the middle-most class (3rd quintile) relative to the top 20 per cent. There is clearly a catch-up in purchases of all food components in the table by the middle 20 per cent, relative to the richest income group (top 20 per cent) – from a ratio of roughly 85 per cent in 1995 to over 90 per cent in the case of meat, over 97 per cent in the case of fresh vegetables and over 95 per cent in the case of fresh eggs by 2009.

A very high degree of income disparity across classes in 1995 with the gap increasing in the period 2001-09 can be clearly seen from Table 7.5f. All the three ratios decline monotonically. The picture as regards urban food expenditure across income classes, also reveals wide disparities. The ratio of the richest 20 per cent to the poorest 20 per cent as regards expenditure on all food and on eggs, aquatic products and milk and dairy products shows similar trends and drastic declines from the 1995 levels. From roughly half in 1995 the ratios in these two expenditure categories declined to roughly a quarter by 2009. In the case of expenditure on grains and meat, the trends are again a continuous decline but of a lower quantum than in the other categories. Interestingly, and in contrast to the observed trends in purchases in physical terms (quantities) the position (ratio) of the middle classes vis-a-vis the richest class as regards expenditure on food and its components shows a continuous decline. The same is true as regards the richest 40 per cent vis-a-vis the poorest 40 per cent.

There appears a potential contradiction in both these tables, in that physical quantities purchased by different income groups does not correspond to expenditures. This can be attributed to two reasons. First, food expenditures by the richest classes include several other components not listed in the table, which may be categorized as high quality foods such as fruits, nuts, dairy products and others. Secondly, the items in both the tables are not identical and therefore not easily comparable. For instance, meat in table 7.5e does not include poultry and other types of meat where as in table 7.5f it does. Similarly grain expenditure data is available in Table 7.5f but not grain purchases across income groups in Table 7.5e.

Table 7.5f: China: Relative Urban Income and Expenditure on Food by Income Classes in Urban, 1995-2009

	1995	2001	2003	2004	2005	2006	2007	2008	2009
Incomes (ratios)									
	Per Capita Annual Income								
Bottom 10 %/ Top 10%	0.265	0.186	0.118	0.112	0.108	0.111	0.115	0.110	0.116
Bottom 20 %/ Top 20%	0.472	0.388	0.304	0.294	0.288	0.292	0.298	0.289	0.299
Middle 20 % / Top 20%	0.330	0.245	0.170	0.163	0.156	0.161	0.165	0.157	0.165
	Per Capita Annual Net (Disposable) Income								
Bottom 10 %/ Top 10%	0.255	0.185	0.119	0.113	0.109	0.112	0.114	0.109	0.112
Bottom 20 %/ Top 20%	0.466	0.388	0.308	0.299	0.292	0.296	0.302	0.292	0.299
Middle 20 % / Top 20%	0.321	0.244	0.171	0.164	0.158	0.162	0.165	0.157	0.162

Annual Per Capita Expenditures (Ratios)									
	Living Expenditure								
Bottom 10 %/ Top 10%	0.342	0.274	0.177	0.170	0.162	0.163	0.173	0.168	0.169
Bottom 20 %/ Top 20%	0.548	0.484	0.378	0.369	0.357	0.357	0.369	0.356	0.362
Middle 20 % / Top 20%	0.410	0.337	0.236	0.229	0.220	0.223	0.232	0.222	0.225
	All Food								
Bottom 10 %/ Top 10%	0.502	0.445	0.282	0.288	0.275	0.276	0.296	0.277	0.282
Bottom 20 %/ Top 20%	0.568	0.508	0.346	0.353	0.336	0.339	0.357	0.338	0.345
Middle 20 % / Top 20%	0.775	0.749	0.598	0.596	0.596	0.596	0.615	0.599	0.609
	Grain								
Bottom 10 %/ Top 10%	0.811	0.839	0.775	0.840	0.821	0.804	0.686	0.644	0.651
Bottom 20 %/ Top 20%	0.857	0.877	0.796	0.860	0.830	0.817	0.713	0.675	0.692
Middle 20 % / Top 20%	0.916	0.962	0.878	0.908	0.910	0.908	0.869	0.852	0.862
	Eggs, Aquatic Products, Milk and Dairy								
Bottom 10 %/ Top 10%	0.471	0.440	0.214	0.233	0.236	0.251	0.272	0.269	0.270
Bottom 20 %/ Top 20%	0.543	0.495	0.269	0.290	0.289	0.303	0.328	0.322	0.327
Middle 20 % / Top 20%	0.778	0.767	0.562	0.574	0.584	0.598	0.622	0.613	0.625
	Meat & Poultry								
Bottom 10 %/ Top 10%	0.521	0.558	0.434	0.456	0.454	0.477	0.457	0.432	0.442
Bottom 20 %/ Top 20%	0.585	0.614	0.488	0.505	0.496	0.524	0.509	0.480	0.501
Middle 20 % / Top 20%	0.808	0.855	0.764	0.779	0.794	0.789	0.779	0.776	0.795

Source Data: CSY, Various years

The inference that can be drawn from these two tables is that there are varying degrees of disparities across urban income groups in terms of physical quantities of food consumed as well as expenditure on food. Following the observations in the previous sub-section, the more relevant issue concerns disparities in rural China. Table 7.5g presents indicators of disparities in income and expenditures by income classes similar to the previous two tables, except that the ratio of the lowest 40 per cent to the top 20 per cent is estimated here instead of the lowest 20 per cent to the top 20 per cent and the lowest 20 per cent to top 20 per cent is estimated instead of lowest 10 per cent to top 10 per cent.

Table 7.5g: China: Rural Income and Consumption Expenditure by Income Classes

	2002	2003	2004	2005	2006	2007	2008	2009
Rural Incomes (ratios)								
Per Capita Annual Income								
Lowest 20% / Top 20%	0.205	0.197	0.200	0.205	0.203	0.198	0.206	0.197
Lowest 40% / Top 20%	0.507	0.488	0.500	0.501	0.496	0.485	0.493	0.474
Middle 20% / Top 20%	0.400	0.390	0.398	0.394	0.393	0.390	0.387	0.378
Cash Income								

Lowest 20% / Top 20%	0.154	0.150	0.144	0.164	0.161	0.158	0.165	0.167
Lowest 40% / Top 20%	0.394	0.384	0.378	0.409	0.409	0.401	0.405	0.407
Middle 20% / Top 20%	0.341	0.338	0.334	0.347	0.349	0.347	0.343	0.344
Per Capita Annual Net (Disposable) Income								
Lowest 20% / Top 20%	0.145	0.136	0.145	0.138	0.140	0.138	0.133	0.126
Lowest 40% / Top 20%	0.408	0.390	0.411	0.398	0.402	0.401	0.393	0.378
Middle 20% / Top 20%	0.367	0.358	0.372	0.368	0.372	0.374	0.372	0.365
Rural Expenditures (ratios)								
Per Capita Total Expenditure								
Lowest 20% / Top 20%	0.312	0.313	0.315	0.352	0.331	0.323	0.342	0.342
Lowest 40% / Top 20%	0.690	0.686	0.694	0.756	0.710	0.693	0.714	0.706
Middle 20% / Top 20%	0.467	0.463	0.769	0.486	0.471	0.461	0.455	0.446
Living Expenditure								
Lowest 20% / Top 20%	0.288	0.284	0.302	0.337	0.308	0.309	0.313	0.315
Lowest 40% / Top 20%	0.470	0.461	0.473	0.507	0.487	0.490	0.480	0.474
Middle 20% / Top 20%	0.662	0.650	0.685	0.754	0.694	0.702	0.700	0.698
Food expenditure								
Lowest 20% / Top 20%	0.415	0.403	0.430	0.441	0.410	0.423	0.432	0.425
Lowest 40% / Top 20%	0.597	0.588	0.611	0.620	0.587	0.602	0.606	0.596
Middle 20% / Top 20%	0.922	0.903	0.951	0.966	0.908	0.935	0.945	0.932

Source Data: CSY, various years

The indicators (ratios) of income disparity reveal a higher degree of inequality (though stable) in rural China compared to the urban. The ratio of incomes (both total and disposable) of the lowest quintile to the highest quintile is roughly half (20 per cent in 2002) in the case of the rural compared to the urban (38 per cent in 2001) though over time, while it declined in the case of the latter (to 30 per cent in 2009), it remained stable in rural China at around 20 per cent. However, the average income of the bottom 40 per cent has remained at roughly half of that of the richest 20 per cent as regards total income, whereas in the case of disposable income and cash income it has remained stable at around 40 per cent over the entire period.

As regards rural total expenditure and expenditure on food, stability in all the indicators over time is visible unlike in urban China where the ratios declined between 1995 and 2009. The inferences on income disparities in rural China in this sub-section in combination with the declining rural per capita food consumption discussed in the previous section, do provide strong grounds to conclude at the least, that food consumption by lowest income group (fifth quintile) may be at a level that does not provide adequate nutrition - less than the norm of 2200 Kcal per capita per day. From the estimates in the previous section which revealed an average of less than 2200 Kcal per capita per day for the entire rural population, it could be concluded that there may be widespread under-nutrition. Agricultural stagnation and the effects of recession in industrialized countries with which rural China is

closely entwined, an agrarian crisis cannot be entirely ruled out. The trends in rural nutrition estimated above are disturbing, and while it may not be appropriate to talk of a "People's Republic of Hunger" to paraphrase Patnaik's description of India as having emerged as a 'Republic of Hunger', these very similar adverse trends regarding food security in China need to be recognized and closely monitored.[9].

Appendix Tables

Table A7.1: China: Production and Domestic Supply of Food Grains*, 1978-2007

	Million Metric Tons				Proportion of Domestic Supply			Per capita (kgs)	
	Production	Net Imports	Domestic Supply**	Food	Food	Net Imports	Production	Food	Domestic Supply
1978	265.8	11.4	276.0	201.1	0.729	0.041	0.96	205.9	287.7
1979	280.1	15.5	285.6	207.8	0.727	0.054	0.98	209.7	293.6
1980	269.4	16.3	290.5	209.7	0.722	0.056	0.93	208.8	294.5
1981	271.1	18.2	295.6	215.6	0.729	0.062	0.92	211.8	295.6
1982	295.1	20.1	314.8	231.3	0.735	0.064	0.94	224.2	310.5
1983	324.8	18.4	333.4	239.2	0.717	0.055	0.97	228.7	324.3
1984	341.6	13.5	341.7	246.7	0.722	0.039	1.00	232.6	327.6
1985	315.5	3.5	335.7	244.6	0.729	0.011	0.94	227.3	317.0
1986	325.7	5.3	337.5	245.5	0.728	0.016	0.97	224.6	313.6
1987	335.0	17.0	346.7	246.3	0.710	0.049	0.97	221.9	316.8
1988	328.7	16.2	346.4	245.5	0.709	0.047	0.95	217.6	311.2
1989	339.9	18.3	359.0	251.3	0.700	0.051	0.95	219.5	317.4
1990	375.0	16.4	374.6	257.5	0.688	0.044	1.00	221.7	326.2
1991	367.5	11.2	381.9	255.2	0.668	0.029	0.96	216.9	328.1
1992	373.3	6.3	384.3	258.7	0.673	0.016	0.97	217.5	326.1
1993	385.1	0.9	387.7	260.4	0.672	0.002	0.99	216.6	325.2
1994	373.4	5.0	387.0	254.6	0.658	0.013	0.96	209.7	321.2
1995	394.4	27.7	416.7	254.7	0.611	0.066	0.95	207.8	342.2
1996	429.2	17.4	436.0	262.4	0.602	0.040	0.98	211.9	354.5
1997	415.4	3.6	421.8	262.3	0.622	0.009	0.98	209.9	339.7
1998	433.6	2.2	424.4	261.7	0.617	0.005	1.02	207.5	338.7
1999	430.7	3.0	416.8	259.8	0.623	0.007	1.03	204.2	329.8
2000	386.8	-3.5	403.8	254.6	0.630	-0.009	0.96	198.5	317.0
2001	380.6	2.7	401.5	247.7	0.617	0.007	0.95	191.5	312.7
2002	384.6	-4.1	382.3	239.9	0.627	-0.011	1.01	184.1	295.6
2003	364.3	-11.6	366.2	228.4	0.624	-0.032	0.99	174.1	281.2
2004	394.7	14.2	419.0	228.0	0.544	0.034	0.94	173.9	319.6
2005	409.8	5.3	419.9	228.3	0.544	0.013	0.98	173.0	318.2
2006	424.6	7.7	419.1	224.1	0.535	0.018	1.01	168.8	315.6
2007	428.4	0.3	422.8	222.0	0.525	0.001	1.01	166.2	316.4

* Food grains include all cereals, tubers (starchy roots) at $1/5^{th}$ weight and pulses (Soybean is not included and its availability never exceeded 5 kgs per capita per year during the entire period).

** Domestic Supply includes changes in stock, therefore production minus net exports does not exactly equals domestic supply. Source: FAO-SUA

9 See Patnaik (2007) *The Republic of Hunger and Other Essays*

Table A7.2: China: Net Imports of Food Grains, 1978-2007

	Volume of Net Imports, Million MT				Share in Food Grains %		
	Food grains	All Cereals	Wheat	Maize	Cereals	Heat	Maize
1978	11.4	11.4	8.5	3.2	99.7	74.4	27.9
1979	15.5	15.5	9.6	5.6	100.1	61.9	36.4
1980	16.3	16.4	11.8	4.6	100.8	72.6	28.2
1981	18.2	18.5	13.8	3.5	101.5	75.8	19.0
1982	20.1	20.2	14.7	4.4	100.8	73.5	21.9
1983	18.4	18.5	12.2	5.9	100.4	66.0	31.8
1984	13.5	13.5	11.0	2.3	100.2	81.7	17.2
1985	3.5	3.4	6.4	-2.9	97.3	182.7	-82.8
1986	5.3	5.8	7.3	-1.6	109.4	138.0	-30.6
1987	17.0	17.4	14.9	1.8	102.3	87.5	10.4
1988	16.2	16.6	15.8	0.8	102.8	97.9	5.2
1989	18.3	18.2	16.2	1.1	99.5	88.4	6.0
1990	16.4	16.5	13.7	2.2	101.0	83.8	13.3
1991	11.2	11.8	13.6	-2.1	105.4	121.6	-19.1
1992	6.3	6.9	11.7	-4.8	109.7	187.0	-76.7
1993	0.9	1.3	7.2	-5.5	151.8	807.8	-621.9
1994	5.0	6.1	8.2	-3.1	122.4	164.3	-62.8
1995	27.7	28.1	12.6	11.9	101.5	45.5	42.9
1996	17.4	17.3	8.7	6.2	99.1	50.0	35.8
1997	3.6	3.3	2.5	-0.8	92.8	69.2	-23.3
1998	2.2	1.9	2.5	0.5	86.0	116.9	22.4
1999	3.0	2.9	1.7	0.7	96.1	55.7	23.5
2000	-3.5	-3.9	2.1	-5.5	110.2	-60.1	157.4
2001	2.7	1.5	1.2	-0.7	56.0	45.2	-27.3
2002	-4.1	-5.1	1.0	-6.6	124.2	-23.7	163.4
2003	-11.6	-12.9	-0.7	-11.4	111.5	6.1	98.3
2004	14.2	11.6	7.4	2.5	82.1	51.9	17.5
2005	5.3	3.0	4.3	-3.8	57.2	81.6	-71.3
2006	7.7	4.0	0.1	1.9	52.1	1.8	24.1
2007	0.3	-2.7	-1.7	-0.9	-943.3	-583.9	-321.5
Total (1978-2007)	278.4	267.2	238.4	9.0	96.0	85.6	3.2

Source: FAO-SUA

Table A7.3: China: Direct and Indirect Availability of Food Grains Per Capita, 1978-2007, Kgs

	All Food Grains		All Cereals		Wheat		Rice		Maize		Starchy Roots*		Pulses	
	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed
1978	205.9	50.3	178.9	40.2	53.8	1.3	84.3	1.4	24.2	32.3	22.0	9.1	5.0	1.0
1979	209.7	51.7	185.8	42.1	55.7	1.5	87.7	1.4	25.9	33.8	18.9	8.6	5.0	1.0
1980	208.8	53.6	185.7	43.8	60.9	1.8	84.1	1.5	25.8	36.0	18.2	8.7	4.9	1.0
1981	211.8	52.3	190.7	44.0	65.3	2.0	86.0	1.6	24.7	35.5	16.5	7.2	4.6	1.1
1982	224.2	53.0	203.1	44.3	68.8	2.5	95.1	2.0	24.4	34.6	16.8	7.5	4.3	1.2

	All Food Grains		All Cereals		Wheat		Rice		Maize		Starchy Roots*		Pulses	
	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed	Food	Feed
1983	228.7	59.2	207.9	48.8	73.2	2.9	95.6	2.4	24.3	38.2	16.8	9.2	4.0	1.2
1984	232.6	59.2	213.0	48.7	76.5	2.8	98.0	3.0	24.1	37.9	15.6	9.3	4.0	1.2
1985	227.3	55.2	210.6	44.7	78.1	1.9	97.8	2.6	22.6	35.8	13.1	9.4	3.6	1.1
1986	224.6	52.7	209.0	42.8	79.4	1.8	95.8	2.5	22.8	34.5	12.5	9.1	3.1	0.9
1987	221.9	57.6	205.7	46.3	79.6	1.4	93.6	2.6	22.8	38.4	13.2	10.2	3.0	1.1
1988	217.6	56.6	202.5	46.0	79.0	1.3	91.7	1.9	23.1	39.4	12.1	9.6	3.0	1.1
1989	219.5	59.9	204.8	48.6	80.4	2.2	92.7	3.1	23.2	40.4	11.9	10.3	2.8	1.1
1990	221.7	65.3	207.7	54.1	80.9	2.8	93.4	3.3	25.0	44.4	11.8	10.1	2.2	1.1
1991	216.9	71.9	203.9	61.7	81.4	3.4	94.3	2.2	21.4	50.2	11.3	9.9	1.7	0.3
1992	217.5	69.2	204.6	59.1	81.5	2.5	94.3	2.4	22.0	48.1	11.7	9.8	1.2	0.3
1993	216.6	70.0	202.7	57.7	82.5	2.5	93.2	1.0	20.2	48.7	12.3	11.3	1.6	1.0
1994	209.7	69.4	196.5	57.5	80.1	2.5	90.9	1.5	19.2	46.8	11.7	10.8	1.5	1.1
1995	207.8	90.0	194.3	76.8	79.3	3.8	91.3	3.6	18.8	63.3	11.9	12.3	1.6	0.9
1996	211.9	97.2	197.7	82.7	82.1	4.0	92.1	6.0	18.4	66.3	12.6	12.8	1.6	1.7
1997	209.9	88.4	195.5	76.4	80.2	4.8	91.7	4.9	19.0	61.9	13.0	10.8	1.4	1.2
1998	207.5	90.6	191.9	76.0	78.4	4.4	90.7	3.8	18.6	62.8	14.1	12.7	1.5	1.8
1999	204.2	86.5	188.4	72.4	77.0	2.4	90.0	2.2	17.8	64.1	14.4	12.6	1.4	1.4
2000	198.5	81.7	182.3	67.8	74.0	1.6	88.4	1.4	16.6	61.0	14.8	12.2	1.4	1.7
2001	191.5	82.6	175.4	68.9	73.4	0.8	85.9	0.6	13.2	64.1	14.7	11.9	1.4	1.7
2002	184.1	75.9	166.6	63.1	65.2	0.2	82.8	0.5	15.2	59.4	16.1	10.9	1.4	1.9
2003	174.1	74.5	158.0	61.2	61.4	0.2	78.5	0.6	15.3	56.9	14.9	11.1	1.2	2.2
2004	173.9	98.8	156.5	86.4	69.7	1.9	77.4	7.7	7.0	73.9	16.2	10.5	1.2	1.8
2005	173.0	99.0	155.8	87.4	69.0	2.9	77.4	6.1	7.2	75.5	16.0	9.7	1.2	1.9
2006	168.8	98.0	154.9	87.8	68.6	4.2	77.4	7.6	6.7	73.2	12.6	8.6	1.3	1.6
2007	166.2	99.7	152.5	90.0	67.4	5.1	76.8	7.6	6.7	74.7	12.4	8.7	1.3	1.1

* Tubers are 1/5th of harvested weight. Source: FAO-FBS-SUA

Table A7.4: China: Per Capita Availability of Vegetables and Fruits, 1978-2007

	Vegetables				Fruits			
	Total	Tomatoes	Onions	Other veg.	Total	Citrus	Apples	Other
1978	52.1	5.1	3.2	43.7	7.1	0.7	2.0	4.4
1979	51.8	4.9	3.1	43.8	7.5	0.8	2.5	4.2
1980	49.4	5.0	2.9	41.5	7.3	1.0	2.1	4.2
1981	56.0	4.9	3.3	47.8	8.2	1.2	2.6	4.4
1982	59.4	5.1	3.5	50.8	7.9	1.3	2.0	4.6
1983	66.2	5.4	3.4	57.3	9.4	1.6	2.9	4.9
1984	73.7	5.4	3.4	64.9	9.6	1.7	2.3	5.6
1985	78.6	5.6	3.8	69.2	11.1	2.1	2.8	6.2
1986	90.7	5.4	3.8	81.5	12.4	2.7	2.6	7.1
1987	93.6	5.4	3.8	84.3	15.1	3.4	3.4	8.3
1988	98.6	5.6	3.9	89.2	15.0	2.8	3.4	8.8
1989	98.0	5.6	3.8	88.6	16.4	4.4	3.3	8.7
1990	98.9	6.1	3.9	89.0	16.5	4.6	3.1	8.8

	Vegetables				Fruits			
	Total	Tomatoes	Onions	Other veg.	Total	Citrus	Apples	Other
1991	99.7	6.6	3.9	89.2	18.6	5.7	3.3	9.6
1992	110.2	6.5	4.1	99.6	20.0	4.7	4.6	10.7
1993	128.0	7.9	4.9	115.1	24.2	5.8	6.3	12.1
1994	139.0	9.1	5.6	124.3	27.3	5.9	7.7	13.7
1995	148.0	9.8	6.0	132.2	31.9	7.0	9.3	15.6
1996	163.9	11.5	7.0	145.4	35.0	7.1	11.5	16.4
1997	173.8	11.8	7.2	154.7	37.8	8.3	11.0	18.5
1998	178.3	12.3	7.7	158.3	38.6	7.2	11.8	19.6
1999	196.8	13.3	8.2	175.3	43.9	8.8	12.4	22.7
2000	224.5	15.7	9.8	199.0	43.0	7.0	11.5	24.5
2001	239.4	16.5	10.3	212.6	45.9	9.3	11.0	25.6
2002	254.1	17.6	10.9	225.6	47.3	9.5	10.1	27.7
2003	270.5	19.3	11.7	239.5	49.7	10.6	10.8	28.3
2004	265.4	20.1	12.1	233.2	55.8	11.7	12.2	31.9
2005	270.8	20.5	12.6	237.8	57.9	12.2	12.0	33.7
2006	277.8	20.9	12.9	244.0	61.8	13.7	13.4	34.7
2007	279.9	20.9	13.4	245.6	64.4	15.4	13.8	35.2

Source: FAO-SUA

Table A7.5: China: Availability Per Capita of Vegetable Oils, Sugar and Alcoholic Beverages

	Sugar*	Vegetable Oils		Alcoholic beverages		
		Availability	NetM/DS**	Total	Beer	Other
1978	3.9	2.4	0.076	3.5	0.7	2.8
1979	4.4	2.6	0.068	3.2	0.8	2.4
1980	4.9	3.2	0.074	5.1	1.1	4.0
1981	4.9	3.4	0.035	5.1	1.3	3.8
1982	6.3	3.9	0.019	5.7	1.5	4.2
1983	5.6	4.0	0.007	6.6	2	4.6
1984	6.1	4.4	0.006	7.3	2.5	4.8
1985	7.0	4.4	0.021	8.4	3.3	5.1
1986	6.5	4.7	0.071	10.1	4.2	5.9
1987	7.0	4.9	0.141	11.9	5.4	6.5
1988	8.0	4.8	0.126	13.2	6.3	6.9
1989	6.9	5.5	0.271	12.4	6.1	6.3
1990	7.5	6.1	0.290	13.1	6.5	6.6
1991	7.9	5.8	0.226	14.3	7.6	6.7
1992	7.0	5.4	0.159	16	9	7.0
1993	5.3	5.9	0.125	18.2	10.7	7.5
1994	5.9	6.9	0.279	19.6	12	7.6
1995	6.8	7.1	0.335	22.5	13.3	9.2
1996	7.6	7.3	0.242	21.7	14.1	7.6
1997	8.5	7.4	0.251	23.5	15.6	7.9
1998	8.3	7.7	0.225	23.3	16.3	7.0

	Sugar*	Vegetable Oils		Alcoholic beverages		
		Availability	NetM/DS**	Total	Beer	Other
1999	6.5	7.9	0.211	23.6	17	6.6
2000	6.0	8.4	0.197	24.4	17.9	6.5
2001	6.3	8.6	0.202	26.2	18.2	8.0
2002	6.5	9.5	0.266	27.2	18.9	8.3
2003	7.6	11.3	0.333	27.1	19.8	7.3
2004	6.2	7.3	0.355	30.8	22.9	7.9
2005	6.3	7.5	0.302	32.1	24.1	8.0
2006	6.4	8.2	0.319	35.3	27.1	8.2
2007	8.3	9.4	0.375	38.2	29.9	8.3

* Raw equivalent, ** Net imports as a share of Domestic supply
Source: FAO-SUA

Table A7.6: China: Per Capita Availability of Animal Food Products, 1978-2007, Kgs

	Meat							Aquatic Products		
	Total	Beef	Mutton	Pork	Poultry	Milk	Eggs	Total	Fresh water	Other
1978	11.3	0.3	0.3	8.9	1.6	3.1	2.4	5.4	1.2	4.2
1979	13.4	0.3	0.4	10.9	1.6	3.0	2.5	5.0	1.2	3.8
1980	14.6	0.4	0.5	12	1.7	3.0	2.6	5.2	1.3	3.9
1981	15.1	0.4	0.5	12.3	1.7	3.1	2.7	5.2	1.4	3.8
1982	15.8	0.4	0.5	13	1.8	3.6	2.8	5.7	1.6	4.1
1983	16.2	0.4	0.5	13.3	1.8	3.8	3.0	5.8	1.9	3.9
1984	17.4	0.5	0.6	14.3	1.9	4.1	3.9	6.5	2.2	4.3
1985	19.3	0.5	0.6	16.1	1.9	4.5	4.7	7.3	2.7	4.6
1986	20.8	0.6	0.6	17.2	2.2	5.0	4.8	8.5	3.2	5.3
1987	21.5	0.8	0.7	17.3	2.5	5.3	5.0	9.6	3.7	5.9
1988	23.5	0.9	0.7	18.7	2.9	5.7	5.8	10.5	4.1	6.4
1989	24.4	0.9	0.9	19.3	3.0	5.6	5.9	11.0	4.3	6.7
1990	25.9	1.0	0.9	20.4	3.3	5.9	6.4	11.5	4.5	7.0
1991	27.9	1.2	1.0	21.6	3.9	6.4	7.3	11.5	4.5	7.0
1992	30.5	1.6	1.1	23	4.4	6.6	8.0	13.1	5.1	8.0
1993	33.5	1.9	1.2	24.6	5.5	6.6	9.1	15.4	6.0	9.4
1994	36.7	2.3	1.2	26.5	6.1	7.2	11.3	18.0	6.9	11.1
1995	39.1	2.9	1.4	26.8	7.3	7.7	12.7	20.8	7.8	13.0
1996	38.6	2.9	1.5	26.3	7.3	8.1	14.7	22.5	8.9	13.6
1997	43.8	3.6	1.7	29.7	8.3	8.0	14.1	23.8	9.8	14.0
1998	47.0	3.9	1.9	31.6	9.0	8.2	14.8	24.9	10.3	14.6
1999	48.0	4.1	2.0	31.5	9.8	8.8	15.5	25.3	10.6	14.7
2000	50.1	4.2	2.2	32.5	10.5	9.6	16.2	25.7	10.8	14.9
2001	51.0	4.3	2.3	33.4	10.3	11.1	16.7	25.8	10.9	14.9
2002	52.5	4.6	2.5	34.2	10.5	13.3	17.4	25.6	10.8	14.8
2003	54.8	4.9	2.8	35.3	10.9	16.6	18.3	25.4	10.8	14.6
2004	51.9	4.4	2.6	33.8	10.3	20.5	16.7	25.4	11.2	14.2
2005	54.1	4.4	2.7	35.2	10.9	23.7	17.0	25.7	11.8	13.9
2006	55.1	4.4	2.8	35.6	11.2	27.0	16.8	26.0	12.4	13.6
2007	53.4	4.7	2.9	32.9	11.8	28.7	17.4	26.5	12.3	14.2

Source: FAO-SUA

Table A7.7: China: Availability Per Capita of Energy Protein and Fat by Source, 1978-2007

	Carbohydrates Cal/Cap/Day (Number)			Protein Prot/Cap/Day (Gr)			Fat, Fat/Cap/Day (Gr)		
	Total	Veg.	Animal	Total	Veg.	Animal	Total	Veg.	Animal
1978	2247	2108	139	52.1	45.6	6.5	27.2	15.1	12.1
1979	2297	2137	161	53.6	46.5	7.1	30	15.9	14.2
1980	2327	2153	174	54.3	46.7	7.6	33.1	17.6	15.5
1981	2358	2181	177	55.5	47.8	7.7	34.4	18.6	15.7
1982	2514	2327	187	58.1	49.9	8.2	36.7	20.2	16.5
1983	2557	2365	192	59.3	50.9	8.4	37.5	20.5	17
1984	2624	2415	209	61.3	52.1	9.3	40.4	22	18.4
1985	2616	2381	235	61.8	51.4	10.4	43.1	22.5	20.7
1986	2622	2372	250	62.8	51.5	11.2	45	23.1	21.9
1987	2631	2373	258	63	51.1	11.8	46.3	23.8	22.5
1988	2622	2341	281	63.5	50.6	13	47.6	23.1	24.5
1989	2642	2350	291	63.9	50.4	13.5	50.1	24.7	25.4
1990	2709	2399	310	65.3	51	14.3	53.9	26.9	27
1991	2691	2358	332	65	49.6	15.5	54.6	25.8	28.9
1992	2720	2359	361	67.1	50.2	17	55.9	24.7	31.3
1993	2779	2386	393	71.1	52.2	18.9	61.2	27.3	33.9
1994	2809	2374	435	73.3	52	21.3	67.4	30.1	37.3
1995	2856	2393	463	75	51.6	23.3	69.8	30.5	39.3
1996	2908	2440	467	77.3	52.9	24.4	70.4	31.1	39.3
1997	2960	2450	511	80	53.7	26.3	74.8	31.6	43.1
1998	2977	2433	544	81	53	28	79	33.1	46
1999	2961	2403	558	80.9	52.1	28.9	80.6	33.6	47
2000	2969	2389	580	82.7	52.7	30	84.4	35.6	48.8
2001	2953	2358	595	82.3	51.7	30.7	86	36	50.1
2002	2951	2333	618	81.5	49.9	31.6	90.3	38.2	52.1
2003	2940	2296	644	81.8	48.8	33	96.3	42.2	54.1
2004	2940	2323	617	87.8	55.8	31.9	85.2	33.9	51.3
2005	2974	2335	639	89.4	56.2	33.2	87.8	34.8	53
2006	2967	2313	654	89.1	55.3	33.8	90.2	36.1	54.1
2007	2981	2342	639	88.9	55	33.9	91.7	39.4	52.3

Source: FAO, Food Balance Sheets

Table A7.8: China: Additional Sources of Feed, 1978-2007, Million Metric Tons

	Waste and other Uses of Various Crops						Other Feed Sources	
	Cereals	Starchy Roots	Food Grains**	Oil Crops	Fruits	Vegetables	Sugar Crops*	Oil Crops*** (recoverable)
1978	11.86	8.37	20.43	1.51	0.65	4.33	0.53	7.6
1979	12.68	7.52	20.41	1.61	0.71	4.42	0.12	8.0
1980	12.95	7.70	20.87	1.70	0.68	4.26	0.71	9.4
1981	13.00	7.14	20.34	1.81	0.77	4.92	2.38	10.9

	Waste and other Uses of Various Crops						Other Feed Sources	
	Cereals	**Starchy Roots**	**Food Grains****	**Oil Crops**	**Fruits**	**Vegetables**	**Sugar Crops***	**Oil Crops*** (recoverable)**
1982	14.46	7.45	22.11	2.17	0.73	5.31	3.43	12.6
1983	17.44	8.03	25.65	2.27	0.87	6.14	4.17	13.7
1984	17.44	7.99	25.63	2.70	0.87	7.07	4.07	15.4
1985	15.34	7.37	22.88	2.29	1.02	7.74	8.45	14.1
1986	16.03	7.29	23.49	2.34	1.12	9.36	8.71	13.6
1987	16.73	8.34	25.25	2.61	1.39	9.84	9.81	14.8
1988	16.93	7.94	25.06	2.02	1.41	10.56	10.56	14.3
1989	19.29	7.91	27.37	2.03	1.43	10.60	10.76	14.0
1990	21.30	8.21	29.70	2.05	1.42	10.68	9.14	16.2
1991	21.45	8.31	29.87	1.96	1.59	10.74	12.09	16.9
1992	23.70	8.66	32.45	2.24	1.89	12.22	13.41	17.7
1993	23.38	9.63	33.14	1.66	2.33	14.22	19.46	21.2
1994	24.57	9.21	33.93	1.67	2.72	15.39	19.14	22.0
1995	25.53	9.64	35.31	2.32	3.26	16.52	19.60	22.0
1996	26.55	10.87	37.56	2.09	3.68	18.27	18.87	23.7
1997	24.47	10.20	34.80	2.14	3.94	19.67	18.98	24.6
1998	25.29	10.97	36.41	1.76	4.32	20.35	14.73	26.4
1999	25.00	11.74	36.88	1.97	4.83	22.77	13.14	28.4
2000	22.55	11.85	34.54	2.23	4.94	26.75	11.28	33.8
2001	21.58	11.76	33.49	2.41	5.12	29.10	4.94	37.2
2002	19.69	12.93	32.79	2.22	5.25	31.09	6.51	41.9
2003	18.08	13.81	32.07	2.47	5.39	33.00	2.47	40.2
2004	38.47	14.92	53.54	2.49	5.99	32.65	1.25	43.1
2005	38.98	13.18	52.32	2.44	6.26	33.63	0.62	48.0
2006	42.84	13.39	56.38	2.34	6.67	34.78	0.39	50.3
2007	44.70	12.23	57.06	2.42	7.01	35.38	7.45	51.2

*Sugar crops data is the actual quantities used as feed; ** Food grains include cereals, starchy roots and pulses; *** The recoverable portion of oil crops is the actual volume of oil cake supply if fully utilized. Source: FAO-SUA

8. Concluding Remarks

It is widely acknowledged that China's economy and society have witnessed systematic and transformative change over the last six decades. These sharp socio-economic transformations can perhaps be considered as unprecedented, both in the context of China's long historical trajectory and also in comparison to the much slower pace of change in several other contemporary societies. In the first half of this period (1950-1980), the transformation in China can be described as marking a painful shift from a feudal-colonial polity to that of a socialist nation; involving, in the main, the implementation of radical land reforms. Following the political shifts of the late 1970s however, the scope and direction of official policy and the strategic economic interventions increasingly moved towards a clear embrace of a market-oriented trajectory. During the entire phase, notably, it can be observed that the position and role of rural China remained predominant, while itself undergoing and experiencing profound and often times fundamental transformations.

The most significant aspect of agrarian change in China's development experience until reforms of 1978 was the institutional one. Revolutionary land reforms through direct redistribution altered the fundamental conditions that were critical to agricultural production. The organization of production first in the form of cooperatives, followed by a rapid transition to collectives, enabled not only the redirection of economic surplus (output in excess of that necessary for consumption) for investment, but also the realization of potential economic surplus through the mobilization of surplus labour-time under a cooperative/collective structure. But mobilization of labour for capital construction activities involved a unique system of remuneration in the form of deferred income besides having in place a minimum subsistence guarantee (as discussed in Chapter 3). This was an important element that was critical as an incentive mechanism to elicit labour contribution.

The massive additions to agricultural infrastructure, especially in the area of water conservancy during the 1950s and later during 1965-78, enabled a sustained expansion in agricultural production. Food grain production expanded faster than population, thereby, raising food consumption throughout the 1970s and the 1980s. Though the additions to per capita grain consumption were small, as seen in Chapter 4, the average nutritional standard rose significantly and the egalitarian structure that governed consumption enabled the provision of adequate food to the entire population.

Pre-reform agrarian change included, besides the fundamental transformation of production conditions and expanding agricultural output, the 'industrialisation' of rural China. The significance of rural industrialization lay not only in its employment generating aspects but also in the formation of human capital, alongside providing modern inputs to support agricultural production. Though institutional reforms in agriculture brought back the peasant household as the basic economic unit, the guaranteed entitlement to user right of farmland, combined with the absence of a market for land (officially enforced), preserved one important element of the earlier system, namely access to land for the tiller. But other elements of the market-logic have gradually been integrated into the system, whereby market forces considerably determined the quantum and composition of agricultural output and its distribution. The earlier striving for provision of employment within rural areas, self-sufficiency of the collectives and the principle of egalitarianism were explicitly abandoned in search for individual initiatives, and labour migration from rural to urban areas was both permitted and grew greatly.

Though agricultural production in the post reform period initially expanded rapidly following the large rise in procurement prices, from the early 1990s, the pace of growth slowed down considerably and food grains production became virtually stagnant. With a fixed area of cultivable land for almost five decades, food production had nevertheless expanded much faster relative to population until the early 1990s, because gross sown area was expanding with rise in the proportion of area irrigated and multi-cropping. With the economic reforms, however, the collectively managed irrigation systems became relatively dysfunctional and private investment could not compensate for it immediately. Within this context of decelerating growth, reduction in grain-cultivated areas occurred largely owing to a relative expansion of the area brought under commercial cropping, which could not be compensated by the rise in grain yield. The fall in food grain production per capita from the mid-1990s has been marked and is in sharp contrast to previous trends. This fall should have entailed an increasing dependence on imports to maintain supply, but in fact imports, relative to domestic production, declined precisely when the latter was stagnating, producing a substantial fall in per capita domestic supply. This failure to import suggested that some form of demand compression and change in consumption patterns might be occurring, which was then investigated.

This study examined the composition of food-grain production and consumption and found it to have undergone a significant change since the 1980s. The expansion at a rapid pace up to the mid-2000s of animal products for consumption has meant a large transfer of food grains away from direct consumption by humans, for use as feed to the animal husbandry sector. With rising per capita incomes, it is to be expected on the basis of historical experience and the trends in advanced countries in the developmental

phase, that consumption patterns should show diversification with a sharp rise in grain use as feed. But the experience of these countries show that the total food plus feed demand per capita rises quite sharply as per capita incomes rises, since even though the direct food demand may show a slight fall as the average consumer gets better off, this is more than compensated by the indirect demand for grain of which the feed demand is the major component. However, as analysed in Chapter 7, in China there is a perverse result – with dietary diversification and rising per capita income, the per capita grain consumption for all purposes has declined thoughout the decade since 1996. This pattern — involving the redirection of food grain from human consumption towards animal feed — in the context of stagnant or even declining food grains consumption per capita suggests an undermining of food security for segments of the population and has the potential to aggravate overall food security.

The reforms since 1978 altered production conditions but also fundamentally changed the parameters that govern the distribution of income. A sustained deterioration from the earlier period in, besides others, personal, sectoral and regional dimensions of income distribution has been well documented for post-1978 reform China. It is this fundamental characteristic that determines the demand for and the composition of food in China. The composition of food production follows changes in the composition of consumption. In other words, as the income distribution becomes skewed (income increases accruing disproportionately to higher income groups), the demand for 'higher quality' food (animal products) through its derived demand for feed grains, reduces food grain availability for direct consumption by the poorer segments of the population. In addition, if the weight of the latter is large enough, it can swamp out the increases registered by the former and show up as overall average decline. The resolution of this problem can come about only by an increase in total output that is more than proportionate to the quantum of derived demand and simultaneously, adopt measures to reduce the concentration of incomes. But in the case of China, it was clearly seen that while urban consumption of food grains as well as animal products and other superior foods increased since the mid-1990s, rural consumption of food grains (direct consumption) declined. The seriousness of the situation is revealed by a significant decline in energy levels per capita for rural residents especially since the early 2000s.

Stagnation of production, lowering of consumption for the majority of the rural population, a slowing down of rural economic growth and recessionary conditions in the industrialized world with which China is deeply integrated, together suggest an unrecognized agrarian crisis in China, which has the potential of intensifying. Given the long-term cyclical pattern of policy changes and radical institutional engineering, it may be reasonable to expect another round of major reforms that may serve to avert any unfolding crises.

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