Chinese Agricultural Development in an Induced Innovation Perspective - Implications for Future Strategy

by

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Abstract

The induced innovation model is employed in this paper to aid understanding of the development of Chinese agriculture from 1949 to the present and to identify improved strategies for future agricultural development in China. The paper demonstrates that Chinese agricultural development can be understood as composed of two phases: one from 1949 to 1977 when Chinese agricultural development policy was dominated by "cultural endowments." Marxist ideology led to the implementation of a command economy for the allocation of resources, the adoption of the industrial fundamentalism model of the USSR, the commune system of giant farms, and reliance on non-material incentives for workers. The ensuing weak performance in agriculture led to a second phase, since 1978, during which national policy makers were induced by the potential of alternative institutions and policies for increased growth in agriculture to implement fundamental changes, including adoption of the production responsibility system. Conclusions about strategy identify the importance of much increased development of national markets for agricultural inputs and products, continued flexibility in institution change, and the need for greatly increased investments in technological change in agriculture.

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I. Introduction

The induced innovation model of agricultural development is employed in this paper to aid understanding of the development of Chinese agriculture from 1949 to the present and to identify improved strategies for future agricultural development in China. The openness of discussions and the important papers presented at the Symposium on Rural Development Strategies conducted jointly by the International Agricultural Economics Association and the Chinese Agricultural Economics Association combined with economic policies set forth at the 13th Congress of the Communist Party stimulated the following analysis. Both meetings were held in Beijing in October, 1987.1

The paper has two theses. First, that Chinese agricultural development since 1949 can be understood as composed of two phases: one from 1949 to 1977 when Chinese agricultural development policy was dominated by "cultural endowments"; and a second, since 1978, during which national policy makers were induced by the potential of alternative institutions and policies for increased growth in agriculture to implement fundamental changes. (See also Lin, and Stevens and Jabara.) The second thesis proposes that there is little evidence from current agricultural policy discussions that major policy makers in China yet sufficiently understand the fundamental role of technological change in achieving continuous rapid growth in agriculture. Thus, they have not been induced to undertake the sufficient levels of investment in agricultural research to achieve the high rates of return that are possible.

The model of induced innovation in agriculture identifies four groups of variables as determinants of the growth of agriculture: cultural endowments, physical endowments, institutions, and technology (Hayami and Ruttan, p. 110). When decision makers view the possibilities of significant change in these four groups of variables, cultural endowments are usually assumed to be relatively fixed. Thus the agricultural development strategies pursued in many nations, have placed priority on institutional and particularly technological change
variables. The high pay-offs from the investments in technological advance achieved by many national agricultural research stations and the more recent international agricultural research institutes have demonstrated the central contribution of this group of variables to agricultural growth. More recently, policy makers in many developing nations have gained increased understanding that accelerated agricultural growth can be achieved through changes in institutional arrangements. Recent institutional changes have often focused on "getting prices right" (Schultz). They include reduced discrimination against agriculture through moderation of over-valued exchange rates and the overtaxation of the agricultural sector, as well as through decreased subsidies.

II. The Dominance of Cultural Endowments in Chinese Agricultural Development Policy, 1949 to 1977

A. The Ideological View of Agriculture and Ensuing Policy Initiatives

Marxist ideology was a dominant influence on agricultural development in the first thirty years of the history of the Peoples Republic of China. The general economic development strategy of China followed the industrial fundamentalism example of the USSR. During this period, the priority economic objectives were the development of industry and assurance of food supplies, especially to the cities. To achieve these goals the following measures were carried out. A command system for control of the food and other sectors of the economy was implemented. All private marketing of major agricultural products was abolished. Identity cards were established for population control with no unauthorized migration of labor. After the beginning of the Great Leap Forward in 1958 a policy of provincial food self-sufficiency was increasingly carried out. To obtain funds for industrial development a high indirect tax on agriculture was achieved by establishing provincial and commune quotas for food grains and other products at low fixed prices. From 1953 through 1978, 60 percent of the Chinese government investment budget went to industry and 12 percent to agriculture (Lardy, p. 428).
Additional policies included a coupon rationing system for grains and oils, first in the cities and later throughout the whole country. The classic Marxist sequence for central control of agriculture was followed in China as cooperatives were initially set up in the villages with membership soon becoming compulsory. Then, with the formation of the Communes after 1958, farmers' individual rights to the use of most land were transferred to the sub-county (Commune headquarters) level. Farmers in the villages were organized into brigades and smaller work teams to farm the large consolidated land units. The limited investment in agriculture was largely focused on irrigation and drainage, large agricultural machinery, chemical fertilizer production, and grain variety improvement.

Ideological dominance reached its height with the Cultural Revolution (1966-1977). Provincial self-sufficiency was pushed further. Ideological purity was emphasized and non-material incentives were supposed to increase production as all "ate out of the same pot" no matter what they produced. Equal income distribution was sought through equal wages. It was bad to become richer than anyone else. Universities were closed, with many faculty, especially in the social sciences, punished and driven to the countryside to "learn from farmers."

B. The Weak Performance of Agriculture and the Distortion of the Economy

The dominance of ideology in agricultural policy led to slow growth and serious food problems in some Provinces (Lardy, p. 427). Between 1952 and 1977 the increase in national grain production was estimated at 2.3 percent while population grew at 2.1 percent (Tang, p. 405). Demand for all food, assuming the estimated 3 percent real rate of growth in per capita income during the period implies a rate of growth in demand for food of 4.2 percent - assuming an income elasticity of demand for food of 0.7 (0.7*3 + 2.1). Alternative World Bank income and population growth data for 1965-1980 (World Bank, 1987, p. 202 and p. 254) suggest the same food problem, even using a very conservative income elasticity of demand for food in a low income country of 0.5 (0.5*4.8 + 2.2 = 4.6). Per capita cotton consumption in 1978 was lower than two decades earlier (Lardy, p. 429). In spite of some adoption of
higher yielding grain varieties, investment in expanded irrigation, chemical fertilizer, and large agricultural machines, total agricultural productivity also estimated to have declined due to increasing amounts of higher cost agricultural inputs associated with slow increases in output (Tang, p. 410). The previously specialized cotton areas, such as the Northwest Shantung and Hopeh Provinces and the sugar producing province of Fukien, suffered greatly reduced incomes (Lardy, p. 427).

During this period the rate of increase in per capita agricultural production was slow or negative in some provinces. Lu (p. 5) indicates that over the 25 years from 1953 to 1978 per capita grain production increased only 11 percent, with no change in per capita cotton availability, and a 26 percent per capita decline in oilseed production.

Thus the dominance of cultural endowments expressed as Marxist ideology, stemming from the political and military history of China, led to three fundamental changes in agriculture during this period that reduced the rate of agricultural and national economic growth. First, the policy of provincial self-sufficiency in grains caused large reductions in interprovincial trade, taking away previous gains in production obtained from comparative advantage. Reduction in interregional trade in cotton, oilseed crops, sugar, and grains thus increased the real costs of production and reduced incomes, especially in the previously high trade provinces (Lardy, pp. 425-427). Second, with the shift to the commune organization of agriculture many of the important farm production decisions were taken away from the farmers whose detailed knowledge of local agricultural resources enabled them to more nearly equate marginal costs and marginal returns. And third, emphasis on non-material incentives caused less productive application of agricultural labor.

By 1978 the extent of the distortion of the economy toward industry and urban areas is illustrated by the following data. Industry produced 74 percent of national output with 24 percent of the labor force (Du, p. 2). Rural per capita consumption expenditures were estimated at 133 yuan (approximately U.S. $50) with urban levels 2 to three times greater (Jiang and Luo, p. 5, and U. S. Department of Agriculture, p. 29). While the influence of
cultural endowments can often lead to better economic outcomes, in the case of China during this period the dominance of cultural endowments decreased national economic growth.

III. Induced Institutional Change in Rural China

A. The Shift to the Production Responsibility System

The current reforms seek "a path of socialist rural develop with Chinese characteristics," and "a socialist planned market economy" (Tian, p. 2). The "production responsibility system" announced in 1979, was to be applied in all sectors, as low productivity had also been found in industry. The party leadership also made a large change in ideology. The new message "to get rich first is good" was, for example, communicated on television during the 13th Party Congress by one of the delegates. This party member explained how she was getting rich and what she would do for her community after she got rich.

Under the production responsibility system agricultural land, not reserved for village administrative use and for household subsistence plots, has been divided among the families of the village on the basis of the number of persons, or number of workers in the family. The contract with a family stipulates that the land may be used for 15 years subject to a quota of grain or other agricultural products to be delivered at set government prices (usually below market levels). After the quota is filled, additional production may be sold in free street and other markets, or sometimes to a government marketing agency (See also Yan.). A weakness of the present contract system with farmers was observed in agricultural markets in Huairou, where the international conference was held. In the government food market low quality fruit was available, obtained through the contract system or government marketing agency purchasing system. Individual farmers, however, were selling higher quality fruit in front of the government market. Since under the production responsibility contracts the government price is often lower, a farmer has an incentive to fill his contract with lower quality products so he may obtain more income by selling his higher quality products on the open market.
Two additional important issues have arisen under the production responsibility system: large contract variability, and the need for clarification of land use rights. Under this system government indirect taxation appears highly varied among villages. In one area the contract included the requirement that 15 percent of each family's land be put in cotton. In another, only a certain weight of vegetable products, that represented a small fraction of total output, had to be delivered at contract prices, while in other villages a fairly high percentage of agricultural crops had to be sold at fixed government prices. (See also Gong, p. 5.)

Issues of land use rights have arisen in a number of ways. First, as farmers are not assured use rights after the 15 year period, they are discouraged from investments to increase land productivity. Second, the terms under which the land may be used are not clear. To what extent are family use rights inheritable during the 15 year period? One woman near Ghuongzhou, interviewed in her vegetable field, stated that the criterion for family retention of the land was "as long as it was being productively farmed." The need to be able to transfer use rights among families has been recognized both at the local and national levels, so some families can shift to non-farm employment and so economies of scale may be captured where they are present.

B. Institutional Changes that Cause Prices to More Nearly Reflect Resource Costs

The reform has included adjustments in government prices of many goods in directions that more nearly reflect scarcity values. These actions have reduced the forced transfer of resources out of rural areas. Between 1977 and 1981 state purchase prices for farm products rose on average by more than 40 percent (Lardy, p. 429), with other prices much less changed. In spite of this, by 1987 the relative price for grain was not yet high enough, as grain production has declined since 1984 relative to the production of other crops. The government has kept its policy of low food grain prices in the cities, so an increasing share of the national budget is now devoted to subsidizing all urban consumers, some of whom are government employees on fixed salaries. Urban incomes, however, are generally two to three
times rural incomes. The complexity of government agricultural pricing problems is illustrated by the reimposition of pork rationing in December 1987, due to a shortage of supply to the government.

The new policy since 1985 of permitting individuals to undertake marketing and machinery service activities, often competing with government and other service providers, enables establishment of markets where resource costs can be better known (An, pp. 3-12). Current limits on competition were indicated, however, by discussion in a vegetable producing village outside Guilin. Farmers were allowed to sell their vegetables on the streets in Guilin city, but the village was not permitted to form a marketing cooperative to set up a vegetable stand in the city in competition with the city agricultural marketing monopoly.

C. Policies to Encourage Rural Industry

The economic reforms have sought to greatly increase local employment opportunities for villagers outside the agricultural sector. The establishment of many types of rural industries by townships, villages, and by individual has been encouraged. The symposium participants observed a township that had built a fancy hotel and an elaborate playground for children. A wide range of rural industries was observed including construction, ceramic textile, printing, metal fabricating, and clothing; some targeted at the export market.

D. An Increased Variety of Business Enterprise Arrangements.

New organizational and credit arrangements have been encouraged to facilitate rural non-farm activities (Huang). In addition to the usual public sector enterprises of the different levels of government, individuals and families are now allowed to establish cooperatives (Simei), partnerships, and individual enterprises. Questions at the Symposium about the maximum number of employees an individual enterprise could have usually elicited seven, although in one province the ceiling has apparently been placed at 77 employees. Unsettled issues related to this new institution include bankruptcy. In October 1987 there was discussion in the China Daily of the possible need for bankruptcy laws. In one village visited, a question to a village leader about how failing enterprises would be dealt with was
answered with the statement that profitable village enterprises would bail them out. It was unclear what would happen to the debts of the new family-initiated cooperatives, partnerships, and individual enterprises that failed.

E. The Progress of Agriculture Under the Reforms

Agricultural and grain production increased rapidly between 1979 and 1984, with some slowing of agricultural growth since. Du (p. 3) reported that the value of agricultural output increased at a 9 percent annual rate between 1979 and 1984. Grain production during this period rose from 332 to 407 million tons, while the sown area declined more than 10 percent. The value of total agriculture output increased further in 1985 and in 1968 (3.5 percent) although grain production did not (See also Niu and Calkins.).

The net income of agricultural households is estimated to have increased from 133 yuan in 1978 to 424 yuan in 1986. Household income and expenditure studies show the same increases with a slow rise in consumption expenditures for all consumers from 1952 to 1978, and a sharp increase from 1978 through 1985 (U. S. Department of Agriculture, pp. 1, 4, 10, and 27). The rapid progress in agriculture since 1978 has lead to the risk of underinvestment in agriculture by the Chinese government.

IV. Implications for Future Agricultural Development Strategies

Resource Endowments and the Need for National Markets. The shift from a centralized inflexible physical quota system for the allocation of resources to a market system that generates prices will enable managers of production units to adjust their resource use so that they better reflect real national resource scarcities. This improvement in the allocation of resources will increase national productivity. The large distortions of the economy through subsidies, excessive taxes, government monopolies and arbitrary constraints on trade have slowed productivity growth. Of particular importance, better relative price information will lead to more productive decisions on the development, production and adoption of new, more productive technologies and institutions in agriculture. Increased effort in China to establish
more stable national input and product markets will therefore accelerate growth. These markets will require great expansion of national transportation and communication infrastructure and a reduction in Party and other administrative barriers to interprovincial trade.

**Continued Flexibility in the Development of Institutions.** Because the productivity of institutions depends upon relative resource costs, technology, and cultural endowments, institutions imported from other nations often are not productive in other economic environments. Thus each society needs to facilitate the creation and growth of institutional arrangements that fit the particular socio-economic system. If national policy remains flexible enough to allow many experiments, the development of the unique institutions China needs will be encouraged. In particular, China now requires the creation of stable institutional arrangements for transfers of use rights to agricultural land.

As China shifts away from a largely command economy toward a more flexible, complex economy, more honest disagreements among economic actors are likely, requiring elaboration of commercial and other law, and expansion of courts for the resolution of disputes in a consistent manner. Reliance on the decisions of local Party officials, instead of a set of regulations interpreted by courts, although often enabling speed in decisions, is likely to create higher levels of business uncertainty and provide incentives for bribes and other cost increasing activities. "Among other things, laws or decrees should prohibit specified types of monopolistic, anticompetitive, or exploitative behavior, with legal institutions to interpret and implement these prohibitions. At present in China, the situation is unsatisfactorily vague, with enterprises and local officials free to place their own interpretations on general guidelines from the center" (World Bank, 1985, p. 10).

**The Need for Increased Investment in Technological Change in Agriculture.** The establishment of the production responsibility system in agriculture requires a reorientation of government investment policies for agriculture. The immense institutional change from very large to small managements units in agriculture greatly affects the productivity of
much agricultural technology. Although some of the currently available more productive agricultural technologies in China, such as crop varieties, are equally productive on large and small management units, achieving the productive application of complementary inputs such as fertilizer and pesticides often requires considerable modification in hand and motor powered agricultural technologies to increase productivity. (For a recent general review of Chinese agricultural technology see Wittwer, Yu, Sun, and Wang.)

The need for changes in agricultural research policy is illustrated by current machinery development and wheat breeding in China. In agricultural mechanization many of the machinery research institutes and universities tend to focus their research priorities on high technology developments and large machines. In the next decade or two, a reorientation of agricultural mechanization research toward much simpler more productive hand and small motor powered machines for use on the millions of small family farms throughout China would contribute more to assure continued rapid growth of Chinese agriculture. (See Gong, p. 3, Gu, Liu and Wang.) To be effective such research will require types of farming systems research, carried out on farmers' fields to complement research in laboratories and on experiment stations. Success in the production of small agricultural machines might have export potential, as current Japanese agricultural machines are generally too complex and expensive (M. L. Esmay, personal communication).

High quality wheat breeding is underway in only one place in China. But this research unit has undertaken little research on consumer acceptance of new varieties. Although additional wheat breeders are currently being trained overseas, as they return much improved laboratories and research equipment will be required in a number of provinces in order to enable more rapid progress in wheat breeding. Also, much more crop management research on farmers' fields with the new varieties will be required to determine the most economic quantities, timing, and placement of fertilizers and pesticides (E. H. Everson, personal communication).
The Continuing Influence of Cultural Endowments on the Ongoing Reform. Cultural endowments, most prominently in the form of the Communist Party ideology, will continue to set criteria for the evaluation of changes in institutions and technology. In particular, ideology will continue to influence the rate of shift from a command to a more flexible economy.

FOOTNOTES

1 The author's experience of Asian Agriculture over the last thirty years in non-socialist societies provided valuable perspective for this immersion in the agricultural development problems of a changing Asian socialist society (Stevens, 1976 and 1977).

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You

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