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Is small beautiful? Farm size, productivity, and poverty in Asian agriculture

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Abstract

Small farms characterize agriculture in Asia. With the fragmentation of land holdings, the average size of farms fell in the region, while the number of small-size holdings increased significantly. These small-scale farmers play an important role for food security and poverty alleviation. However, whether and how these small farms can survive under globalization is a hotly debated topic. In particular, the traditional claim that "small is beautiful," which is based on empirical observation that small farms present higher land productivity than large farms, is being challenged. It has been shown that a positive relationship also exists between farm size and labor productivity (and therefore income). To help these small farms prosper under increasing globalization, the governments have to change the "business as usual" attitude. Innovative land reform, for example, is crucial to secure property rights to farmers and to increase farm size. Equally important is the reform of public institutions in order to help small farmers to have access to credit, marketing, and technology. Moreover, promoting diversification in the production of high-value commodities can play an important role in raising the small-holders' income. Finally, policies that facilitate urban–rural migration and promote the development of the rural nonfarm sector are essential to help alleviate poverty among small-farm households and among the rural poor in general.

JEL classification: J22, N65, O13, Q15

Keywords: farm size; productivity; poverty; Asia; smallholders

1. Introduction

The debate on the relationship between farm size and productivity in Asia has gone through a complete circle. In the 1960s small farms were regarded as being efficient because they could fully use their resources, particularly family labor, and they could monitor their production activities more closely. In the 1970s and 1980s, however, as many Asian countries moved rapidly toward industrialization and urbanization, small farms were regarded as a major obstacle in this process. On the one hand, industrialization leads to greater demand for labor from rural areas, which is in conflict with labor-intensive small farm practices. On the other hand, by providing cheaper modern inputs such as machinery, industrialization made an increase in farm size possible by relaxing labor constraints during the peak season. Therefore, there was a call for larger farms in the 1970s and 1980s. In the 1990s, however, "the small is beautiful" view was once again revived. In the past decade, agricultural production has become more diversified into high-value commodities, for example, from grains to cash crops, and from crops to livestock and horticultural products, in which small farms may have comparative advantages. Moreover, large farms and input-intensive practices (fertilizer, pesticides, machinery) have led to the degradation of natural resources and the environment. When these externalities are considered, large farms may no longer be viewed as efficient.

About 55% of the world's population lives in Asia, 58% of which depends on agriculture for a livelihood. However, the Asian region holds only 20% of the world's agricultural land. Moreover, the average size of holdings continues to fall in several countries of the

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region with the fragmentation of land holdings. Today, in most countries of Asia, the average land holding ranges from only 1 to 2 hectares, well below the world average of 3.7 hectares per person. At the same time, the number of small-size holdings has increased significantly (Pookpakdi, 1992). As the world has become increasingly globalized, whether these small farms can survive is a hotly debated topic. The objectives of this paper are to review the evidence between farm size and productivity, and between farm size and poverty, and to synthesize whether and how small farms can prosper under increasing trade liberalization. This article focuses on five Asian countries, namely China, India, Thailand, Japan, and South Korea.

The paper is organized in five parts. Section 2 describes the changes in farm size over the past several decades and explores the reasons behind these changes. Section 3 reviews the level and the rate of change in production and productivity. The links between production growth, productivity, and farm size are explored in Section 4, while Section 5 assesses how small farmers can prosper under globalization, and offers policy options on how governments can help small farms avoid the adverse effects of trade liberalization and globalization.

2. Changes in farm size

Farm size varies substantially among countries in Asia, and has changed dramatically over the last several decades. Table 1 presents the average farm size and its change over time in China, India, Thailand, Japan, and South Korea.[1] Small farms characterize the agricultural sector in the five Asian countries. In the early 1990s, the average farm size in Thailand was the largest, at 3.36 hectares, compared with 1.55 hectares in India, and 1.37 and 1.23 hectares in Japan and South Korea, respectively. The average Chinese farm was significantly smaller, averaging 0.43 hectares.

The determination of farm size and its change over time is complex. This includes factors such as history, institutions, economic development, the development of the nonfarm sector (both in rural and urban areas), land and labor markets, and policies related to land tenure and property rights. Among these factors, land policy, institutions, and legislation have been the most influential.

Table 1
Average farm size

	China	India	Thailand	Japan	Korea
	(Hectares per Farm)				
1950		2.20			
1960		2.70	3.47	1.00	2.06
1970		2.30		1.01	0.88
1977		2.00			
1980	0.56	1.84	3.70	1.17	1.02
1985	0.51	1.69		1.23	1.11
1990	0.43			1.37	1.19
1991		1.55		1.37	1.23
1992				1.38	1.26
1993			3.36	1.39	1.29
1994				1.40	1.30
1995	0.41			1.47	1.32
1996				1.47	1.32
1997				1.48	1.34
1998				1.49	1.35
1999	0.40			1.50	1.37
2000				1.55	1.37
2001				1.56	1.39
2002				1.57	1.46

Sources: China: Statistical Yearbook of China (SSB), various issues.
India: 1950, 1960, and 1970 from FAO's supplement to the World Census of Agriculture; 1977 from FAO's World Census of Agriculture; 1980, 1985, and 1991: data downloaded from IndiaStat.
Thailand: All data from FAO's supplement to the World Census of Agriculture.
Japan and Korea: 1960 and 1970 from FAO's supplement to the World Census of Agriculture; 1980–2002 from the Korean Ministry of Agriculture and Forestry.

2.1. Japan

Immediately after World War II, drastic agricultural land reform was implemented in Japan. Land reform in Japan demolished a class structure based on landholding. Landlords were no longer supreme and rural society was restructured, so the rural population became supportive of the ruling conservative party. But land reform had little effect on agricultural production. Land ownership was transferred from landlords to tillers of the soil, and small tenant farmers became small owner-cultivators, with no apparent change in farm size. The

[1] The size and number of agricultural holdings are typically surveyed in agricultural census. To our knowledge, Thailand's and India's latest agricultural census were conducted in 1993 and 1990/91 respectively.

traditional agricultural production structure from prewar Japan remained (Kawagoe, 1999).

The year 1961 marked a turning point in Japan's agricultural sector with the passing of the Basic Law of Agriculture, which supported an expansion in the size of farms to balance farmers' incomes with those of city workers (Ukawa, 1995). Since then, several amendments to this law as well as various policies aimed at increasing the scale of farms have been passed, which promoted an increase in the size of farms (Kajii et al., 1988). The major reason for the slow increase in Japanese farm size, however, is the heavy subsidy on agricultural production, which artificially raises farmers' incomes; the high proportion of farmer's incomes, which comes from the nonfarm sector (82% in 2001, MAFF); and the extremely high land prices.

2.2. *South Korea*

In contrast to Japan, the average size of a farm in South Korea declined drastically after World War II, from 2.06 hectares in 1950 to 0.88 hectares in 1960. This significant drop was a result of the Land Reform Program, which marked the beginning of the modern agricultural system in South Korea. Prior to 1950, land was highly concentrated: a small number of landlords owned most South Korean farmland. Most agricultural workers were tenants and paid rent to the landlords, sometimes in excess of 50% of gross revenue. With the Land Reform Program, the government established a maximum farm size of 3 hectares and bought any farmland in excess of that limit. In addition, the government procured farmland owned by nonfarmers. The purchased land was redistributed to small or landless farmers (Kim, 1992). Since the 1970s, the total area of farmland has been declining in South Korea as a result of the increased demand for land by the nonagricultural sector. However, the decline in the number of farm households over the same period was greater (Kim, 1992). As a result, the average area per farm household increased marginally, from 0.93 hectare in 1970 to 1.46 hectares in 2002.

2.3. *Thailand*

The average farm size in Thailand has remained constant—at around 3.4 hectares—for the past several decades.[2] Historically, the King owned all the land in Thailand. The concept of individual land ownership was introduced by the King Chulalongkorn in 1874, and by 1901 formal land title could be obtained. In 1975, the Parliament passed the Agricultural Land Reform Act, which aimed at distributing land owned by private owners to landless and tenant farmers. However, the implementation of the reform was constrained by the military coups in 1976 and 1977. Although over 70 areas of the country were elected as Land Reform Areas by 1979, the Agricultural Land Reform Office was unsuccessful in acquiring land for redistribution as large landholders, wealthy aristocrats, businessmen, and senior military officers opposed the designation of the Land Reform Areas. Today, many landowners still hold legal title to their land, and many farmers still lack legal title of ownership (Cabrera 2002).

2.4. *India*

In contrast to the trends in Japan and South Korea, the average farm size decreased in India and China. Table 1 shows that India's average farm size declined from 2.20 hectares in 1950 to 1.55 hectares in 1991. But this average masks a large variation among different subgroups and a dramatic change in farm size structure over time (Table 2). The total number of rural households almost doubled in India from 63.5 million in 1953–1954 to 116.4 million in 1991–1992. Despite this huge increase, the number of landless households remained constant at about 14 million between 1953–1954 and 1991–1992. However, the share of rural households that was landless declined significantly over time, from 23% in the mid 1950s to 11% in the early 1990s (Table 2). On the other hand, the number of landed households (owning greater than 0.01 acres) increased dramatically (from 48.8 million in 1953–1954 to 103.3 million in 1991–1992), showing that despite rapid population growth, most rural households have been able to acquire at least a small amount of land. Of the landed households, the vast majority owns 5 acres or less, and most of the increase in farm numbers has occurred among the submarginal

[2] This review of Thailand's land policy and institutions draws heavily on information obtained from http://www.1upinfo.com/country-guide-study/thailand/thailand94.html.

Table 2
Size distribution of ownership holdings, India

Size Category of Holding (acres)	Number and Percentage[a] of Total Ownership Holdings (millions)				
	Year				
	1953/54	1961/62	1971/72	1981/82	1991/92
Landless (<0.01)	14.67	8.47	7.56	10.64	13.09
	(23.1)	(11.7)	(9.6)	(11.3)	(11.3)
Submarginal (0.01–0.99)	15.36	23.58	27.61	34.61	46.69
	(24.2)	(32.6)	(35.2)	(36.9)	(40.1)
Marginal (1.0–2.49)	8.88	11.48	13.91	17.30	23.88
	(14.0)	(15.9)	(17.7)	(18.4)	(20.5)
Small (2.5–4.99)	8.57	10.92	12.14	13.96	15.62
	(13.5)	(15.1)	(15.5)	(14.7)	(13.4)
Medium (5.0–14.99)	11.15	13.00	12.98	13.78	14.09
	(17.5)	(18.0)	(16.6)	(14.7)	(12.1)
Large (>15.0)	4.91	4.95	4.18	3.73	3.04
	(7.7)	(6.8)	(5.3)	(4.0)	(2.6)
Total	63.53	72.47	78.37	93.86	116.41
	(100)	(100)	(100)	(100)	(100)

Note: [a]Percentages are in parentheses.
Source: Thorat et al. (2003).

and marginal holdings. Taken together, these three categories accounted for 74% of all landed holdings in 1991–1992, up from 52% in 1953–1954. At the same time the number of large farms (15 acres and above) has fallen, from 4.9 million in 1953–1954 to 3 million in 1991–1992. Many of these changes appeared to have occurred most rapidly after 1981–1982 (Table 2).

The decline in the number of large farms suggests that much of the growth in the number of smaller farms may have resulted from the subdivision of large farms. Thorat et al. (2003) found that the share of the total land area owned by large farms declined from 52.5% in 1953–1954 to 26.7% in 1991–1992, while the average size of large farms dropped from 32.7 acres to 25.5 acres over that same period. Despite the reallocation of land from large to smaller farms, the distribution of owned land has barely improved when measured by the Gini coefficient, which fell from 0.75 in 1953 to 0.71 in 1991, with all the change occurring between 1953 and 1960 (Thorat et al., 2003).

2.5. *China*

China has experienced three major land policy and institutional reforms since the establishment of the People's Republic in 1949. The first land reform, which was characterized by the confiscation of land from landlords, and redistribution to landless poor farmers, was completed in 1953. This was soon followed by a second land reform, in which government policies promoted the development of large, collective operations. Consequently by 1956 most of China's agricultural production was done on a collective basis. Under this system, land ownership was vested in a collective that usually consisted of around 200 families. Beginning in 1958, the central government promoted an even larger scale of production in agriculture. Advanced cooperatives were merged into communes. At the height of the Commune movement in 1958–1959, the *average* communal unit had grown to 5,000 households covering 10,000 acres. Virtually all production means other than agricultural labor were owned by communes. Failures in the commune system, along with a great natural disaster, which lasted for 3 years (1959–1961), led the government to implement an adjustment and consolidation policy after 1961. Production was decentralized into a smaller production unit called a production team—a subunit of the commune consisting of only 20–30 neighboring families. Under this form of organization, a farmer's income was not closely related to production effort, and virtually all input and output markets were controlled by the government. Moreover,

market transactions of major agricultural products outside of the procurement system were restricted. Market exchanges of land between different production units in the collective system were also outlawed. This system characterized Chinese agriculture throughout the 1960s and most of the 1970s.

In the late 1970s, the third land reform reestablished family farming in China agricultural sector after years of collectivized agriculture (Chen et al., 1998). By 1984, more than 99% of production units had adopted the Household Production Responsibility System (HRS). Under the HRS, farmers had freedom of decision making on major production and marketing activities, but were not given ownership of the land allocated to them. Instead, they were granted user rights. In theory, the collectives or farmers in the same village jointly owned the land. Although the HRS contributed to rapid growth in agricultural production during the initial stage of reforms, land was fragmented due to equal distribution of land to households on an egalitarian basis (i.e., based on household size and demographic composition).

3. Agricultural output and productivity growth

Output and productivity growth are typically used to evaluate the performance of the agricultural sector. Table 3 shows that output has grown the fastest in China (4.57% per year), followed by South Korea (3.39% per year), Thailand (3.25% per year), and India (2.93% per year) since 1961. Japan fared the worst, with agricultural output growth of only 0.58% per year over this period. There was a marked acceleration in the growth rate of agricultural output in India in the 1970s and 1980s (the so-called Green Revolution period) relative to the 1960s, followed by a slowdown during the 1990s (the reform period). On the other hand, output growth decelerated continuously in Japan from 3.23% per year in the 1960s to 1.36% in the 1970s, 0.88% in the 1980s, and continued its slide to a negative growth of −0.88% in the 1990s. For South Korea, agricultural output grew rapidly during the 1960s (5.3% per year) and 1970s (6.68% per year) but experienced a slowdown in the 1980s (3.27% per year) and the 1990s (2.47% per year). Similar to South Korea, output growth accelerated in Thailand from the 1960s (4.01% per year) to the 1970s (4.96% per year) but slowed down in the 1980s (2.41% per year) and 1990s (2.04% per year).

Table 3
Production growth in agriculture

	India (%)	Japan (%)	South Korea (%)	Thailand (%)	China (%)	World (%)
1961–1969	1.23	3.23	5.3	4.01	4.81	2.75
1970–1979	2.58	1.36	6.68	4.96	3.01	2.49
1980–1989	3.77	0.88	3.27	2.41	5.31	2.4
1990–2002	2.56	−0.88	2.47	2.04	5.43	2.23
1961–2002	2.93	0.58	3.39	3.25	4.57	2.32

Note: Growth rates are exponential growth rates.
Source: FAOSTAT (2003).

Table 4
Labor productivity

	China	India	South Korea	Japan	Thailand
	(1995 US$ per person)				
1961	106.1	257.3	2,311.1	8,068.4	377.0
1970	155.9	283.0	2,953.6	10,527.5	509.8
1980	156.9	276.5	3,270.5	17,219.8	620.7
1990	236.0	352.9	7,399.2	26,664.8	773.6
2000	333.2	394.4	13,508.8	30,038.3	934.3
Growth rates (%)					
1961–1969	5.70	0.23	3.73	4.62	3.24
1970–1979	0.17	−0.01	3.76	5.29	2.58
1980–1989	4.09	1.92	8.39	4.30	2.50
1990–2000	3.79	1.59	6.15	1.98	1.61
1961–2000	2.64	1.31	4.72	3.80	2.38

Note: Labor productivity is defined as the ratio of agricultural GDP to economically active population in agriculture.
Source: Calculated from FAOSTAT (2003) and WDI (2002).

In terms of labor productivity (Table 4), taken here to be the value of aggregate agricultural GDP (measured in 1995 US$) per economically active agricultural population, Japan had the highest level of labor productivity, producing more than US$30,000 (in constant 1995 US$) per person in 2000, a level that was 2.2 times higher than South Korea, 32 times higher than Thailand, 76 times higher than India, and 90 times higher than China.[3]

[3] Higher labour productivity in Japan can be attributed to several factors: higher mechanization, higher government financial support, and greater protection on agriculture by isolating domestic from international markets. The latter represents a welfare transfer from consumers to producers. Since agricultural GDP is measured using the domestic prices, labor productivity may be lower when international market prices are used.

There are also marked differences in the pattern of labor productivity growth among these countries. Between 1961 and 2000, South Korea and Japan experienced the fastest growth in labor productivity with 4.72% and 3.80% per year respectively; the comparable figures for China, Thailand, and India were 2.64%, 2.38, and 1.31%. Labor productivity growth deteriorated continuously in Thailand from an annual average of 3.24% in the 1960s to 2.58% in the 1970s, 2.50% in the 1980s, and 1.61% in the 1990s. After three decades of high growth, the rate of labor productivity growth dropped by half in Japan in the 1990s. In South Korea labor productivity grew at impressive rates of nearly 4% per year in the 1960s and 1970s, 8.4% in the 1980s and 6.15% in the 1990s. Finally, India and China encountered a slowdown in labor productivity growth during the 1970s and the 1990s.

The growth performance in land productivity provides a different picture (Table 5). Over the whole period of study (1961–2000) land productivity grew the fastest in China, at 2.89% per year, followed closely by South Korea, India, and Thailand, while Japan experienced a dismal rate of growth of 0.33% per year. China, India, and Thailand shared a similar growth pattern: land productivity growth slowed down in the 1970s but accelerated in the 1980s and 1990s. After an increase in land productivity growth in the 1970s, there was a decline in the rate of growth in South Korea in the 1980s and 1990s. In contrast, Japan showed an erratic growth pattern: land productivity growth declined in the 1970s, increased in the 1980s, and dropped significantly in the 1990s.

Table 5
Land productivity

	China	India	South Korea	Japan	Thailand
	(1995 US$ per hectare)				
1961	89.9	226.3	5,695.2	16,367.1	377.0
1970	139.3	280.1	7,123.5	16,446.8	512.2
1980	147.2	320.0	8,393.9	17,810.8	565.7
1990	219.0	447.6	12,071.6	21,868.6	727.3
2000	317.8	575.8	16,336.5	16,651.9	1,048.7
Growth rates (%)					
1961–1969	6.36	1.54	2.84	1.92	3.40
1970–1979	0.75	1.49	4.39	1.20	1.27
1980–1989	3.64	2.84	3.93	2.03	2.68
1990–2000	4.05	3.04	3.23	−2.33	3.75
1961–2000	2.89	2.63	2.81	0.33	2.46

Notes: Land productivity is defined as the ratio of agricultural GDP to agricultural land.
Source: Calculated from FAOSTAT (2003) and WDI (2002).

Growth in total factor productivity is a ratio of total output growth to total input growth. It is a better measure of efficiency improvements, because growth in total output and partial factor productivities can simply be achieved by using more inputs. Total factor productivity (TFP) for India grew at an average annual rate of 1.75% between 1970 and 1995 (Fan et al., 1999). In the 1970s, total factor productivity did not improve, but it grew rapidly in the 1980s, at 2.52% per annum. Since 1990, TFP growth in Indian agriculture has continued to grow, but at a slower rate of 2.29% per annum. Using district level data from India for 1970–1994, Fan and Hazell (2000) compared TFP growth between irrigated and high and low potential rainfed areas. They found that TFP grew fastest in high-potential rainfed areas during 1970–94 (3.1% per year), followed by irrigated areas (2.21% per year) and the low-potential rainfed areas (1.58% per year). TFP growth has slowed in irrigated areas since 1990, remained unchanged at nearly 4% per year in high-potential rainfed areas, and accelerated to 3.06% per year in low-potential rainfed areas.

In Thailand TFP grew at an average rate of 1.27% per year during 1971–1981, but dropped by nearly 50% in the subsequent period covering 1981 to 1995 (Mundlak et al., 2002). For the whole period of study (1971–1995), TFP grew at an average rate of 1.08% per year. The major sources of TFP growth has been improved varieties of crops and changes in output composition.

TFP grew at an average rate of 1.09% in South Korea over the period 1918–2000. The pattern of TFP growth varies markedly over time. From 1920 to 1960, TFP grew at a dismal rate of 0.09% per year (Park, 2003). Various factors contributed to this low productivity performance, including the colonization of South Korea by Japan (1918–1938), the Second World War, and the Korean War (Sharma, 1991). From 1960 to 1998, South Korean TFP grew rapidly, at an average annual rate of 2.12% per year. Park estimated that productivity growth contributed 52% of South Korean agricultural output growth over the 1918–2000 period.

Productivity analyses in the Chinese agricultural sector typically distinguishes between the pre- and the post-reform period. Beginning with the First Five Year Plan Period (1953–1957), during which large-scale

land reform became one of the priorities of the Communist government, TFP in Chinese agriculture increased steadily, as a result of institutional and technological changes (Fan and Zhang, 2002). TFP declined by 13% per year during the Great Leap Forward (1958–1960), following the establishment of the commune system. From 1961 to 1965 (Adjustment Period), Chinese agriculture recovered through a series of adjustments made by the government, and TFP grew by an annual rate of 4.7%. However, with the Cultural Revolution (1966–1976), production was centrally controlled by the government and executed by production teams. As a result of low incentives, agricultural production was inefficient and there was almost no gain in TFP. With the First Phase of Reform (1979–1984), which was characterized by the decentralization of the agricultural production system, TFP grew by 6.2% per year. Since 1984, agricultural prices and marketing systems have been reformed, and consequently TFP has continued to increase, at an annual growth rate of 2.2%.

Over the last several decades there has been a declining trend in the growth rate of TFP in Japanese agriculture. The average annual growth rate was 2.82% from 1960 to 1968 but dropped to 1.11% in the 1969–1990 period. Kuroda (1997) attributed the sluggish growth rate in TFP after the late 1960s to a slowdown in technological progress. As the average size of farms increased in Japan and South Korea, both land and labor productivities have increased, with a much faster growth in labor than land productivity. On the other hand, in China, India, and Thailand, as farm sizes declined due to the increased rural population, land productivity has increased much faster than labor productivity. In the case of China and India, TFP continued to increase. This all suggests that there might be an inverse relationship between farm size and land productivity and TFP, but a positive relationship between farm size and labor productivity.

4. Farm size and productivity: a literature review

A popular stylized fact in development economics is that there is a strong inverse relationship between farm size and land productivity. Sen, in a seminal paper published in 1962, observed that small farmers were more productive per unit of land than large farmers. The inverse relationship is typically explained by the difference in factor endowments between small and large farms: by using family labor small farms face lower labor transaction costs than larger farms (Raghbendra et al., 2000, Berry and Cline, 1979, Bhalla, 1979). As a result, smaller farms have higher labor/land ratios and can achieve higher yield per hectare (Feder, 1985). The inverse relationship has important implications for land policy, as it entails that any type of land reform that reduces the inequality in landholdings will have a positive effect on productivity (Lipton, 1993, Singh et al., 2002).

A significant volume of literature has been produced on the inverse relationship since Sen's paper, although no consensus on the inverse relationship has been reached. On the one hand, a body of literature supports the hypothesis that small farms produce more per unit of land than large farms (Heltberg, 1996, 1998). With the advent of the Green Revolution, however, research has also shown that the relationship diminishes or is even reversed as agriculture becomes more capital intensive. As a large proportion of the literature has focused on the relationship in India, the empirical evidence from that country is reviewed below, and factors that may explain the lack of consensus on this debate are discussed.

The literature that appears to clearly validate Sen's findings includes Mazumdar (1965), Bharadwaj (1974), Chaddha (1978), Ghose (1979), Bhalla (1979), and Carter (1984). Several explanatory factors on the inverse relationship have been advanced. Some stress that differences in the intensity of land use across farms of different sizes influence land productivity. A typical example is the study by Cornia (1985). Cornia analyzed the relationship between factor inputs, yields, and labor productivity for farms of different sizes in 15 developing countries. In all but three countries (Peru, Bangladesh, and Thailand), a negative relationship was established between farm size and land productivity. Cornia attributed the higher yields observed on small farms to greater application of inputs and to a more intensive use of land. Similarly, Banerjee (1985) observed that smaller farms in the district of Nadia in West Bengal use their land and fertilizer inputs more intensely than the larger farms. Banerjee took the analysis a step further and showed that the cost per unit of output is directly related with the size of holdings, but inversely related with the value of output. This finding implies that small farms are using their

variable resources more efficiently than the bigger farms, yielding higher output per hectare.

Environmental factors also appear to affect the farm size–productivity relationship. Tadesse and Krishnamoorthy (1997) examined the level of technical efficiency across agro-ecological zones and farm size in Tamil Nadu in 1992–1993. The authors found significant differences in the level of technical efficiency among paddy farms across agro-ecological zones as well as size groups. Small and medium-sized farms achieved a higher level of technical efficiency than large holdings. Moreover, the analysis revealed that small and medium-sized paddy farms located, respectively, in the agro-climatic zones of the southern and northeastern part of the state were operating at a higher level of technical efficiency than all other farms.

With the transformation of agriculture toward a science-based approach, family labor becomes less important in shaping land productivity, while other inputs such as fertilizer play a greater role. Following the Green Revolution, farms relied increasingly on purchased inputs and capital. As these inputs require cash and credit flow, they are clearly more accessible to farmers with large landholdings. Opponents of the inverse relationship hypothesis argue that the earlier adoption of new technology by large farmers has reduced or even reversed the yield advantage of small farmers. Deolalikar (1981), for example, found that the inverse size–productivity relationship cannot be rejected at low levels of agricultural technology in India, but can be rejected at higher levels. This finding suggests that although the inverse relationship remains valid for traditional agriculture, it cannot be assumed to exist in an agriculture experiencing technical change. Hanumantha (1975) and Subbarao (1982) also found a positive relationship between farm size and productivity, and attributed this positive association to higher application of fertilizer and other cash-intensive inputs on large farms.

Bhalla and Roy (1988) suggested that the inverse relationship might be a result of differing land fertility between small and large farms. Using a comprehensive dataset with observations including 21,500 farm households from different parts of India, Bhalla and Roy confirmed the inverse relationship at the state level. However, when incorporating soil quality variables and running the regressions on more disaggregated geographical units, the authors observed that the inverse relationship weakened, and in many cases disappeared. The authors concluded that the stylized fact of a negative relationship between farm size and farm productivity might in large part be due to the omission of soil quality variables from the estimated equations. Similarly, Carter (1984) found that intra-village soil quality differences and other farm assets explain part of the size–productivity relationship in Haryana. On the other hand, Newell et al. (1997) argued that in Gujarat the inverse relationship is an interregional phenomenon: farms tend to be smaller in fertile regions and larger in less fertile regions. The authors also observed that labor per hectare is higher on small farms. Thus the inverse relationship between output per hectare and farm size is explained by regional variations in fertility and labor supply.

Managerial factors also appear to have an influence on the inverse relationship. The econometric results of Rao and Chotigeat (1981) showed that when hired labor is employed in preference to family labor and nontraditional capital is used as opposed to traditional capital, large-sized holdings are positively related with higher productivity.

Farm size is typically defined in terms of the physical size of the operational holdings. According to Sampath (1992), this conventional way of defining farm size leads to biased estimates and misleading inferences as it fails to discriminate between irrigation and nonirrigated areas. By adding the two types of land to define total area, one implicitly assumes that one unit of irrigated land has the same cropping intensity potential as one unit of nonirrigated land. Sampath demonstrated that using the conventional definition of farm size in the regression equation leads to biased estimates, resulting in the misleading inference that there are diseconomies of scale in the use of land. In contrast, using the same dataset, the author found that there are no diseconomies of scale in land use when the difference between irrigated and nonirrigated land is recognized in the econometric specification.

5. How small farms can prosper under trade liberalization

As demonstrated above, the relationship between farm size and labor productivity is not clearly established. As shown both empirically and theoretically,

increased labor productivity is essential to raise a farmer's income.

Labor productivity in agriculture can be decomposed into two components, i.e., land productivity and the land-to-labor ratio:

$$Y/L = Y/A \times A/L,$$

where Y is output, L is the number of agricultural workers, and A is the total land area available for agricultural production. To increase labor productivity, and therefore farmers' income, either land productivity has to increase or the land-to-labor ratio has to improve.

This is a daunting task, as the number of small farms is still large and continues to increase over time. For example, the proportion of farms below 1 hectare rose from 45% in India in 1971–1972 to 51.4% in 1991–1992, while the share of the larger farms decreased from 5.3% to 2.6% over the same period (Table 2). Farms of less than 2 hectares constituted 78% of the total number of farms in India but contributed 41% of the national grain production. A large percentage of these small farmers are poor (Fan et al., 1999), and they constitute more than half of the nation's poor in India (Singh et al., 2002). The Chinese agricultural sector is also still dominated by very small farms with less than 1 hectare of land: 83% of Chinese farms were less than 0.6 hectares in 1997, while only 0.24% of farms were bigger than 6.6 hectares. To get the small farmers out of the "poor but efficient" trap, appropriate polices should be carefully designed.

5.1. Reforming land polices and institutions

The success of land reforms in Asia has been mixed. India's land reforms, implemented after the country's independence, consisted of introducing new regulations that place a ceiling on agricultural land, restrict leasing, regulate rents, and provide security of tenure. However, implementation has varied by region. At present, more than 10% of agricultural workers still do not have land, and for landed farmers, a large proportion have extremely small farms, not sufficient to support the farmer's family. The radical approach to land reform used by China and South Korea in the 1950s is no longer politically feasible in India. It is imperative for the government to design and implement an innovative approach to promote more efficient and equitable land policies and institutions.

On the other hand, the Chinese land tenure system provided equal access to land, which has prevented an increase in the number of rural landless poor, and also increased the efficiency of production during the initial stage of the reform in the 1980s. Unfortunately, the current system does not provide permanent ownership for farmers. The lack of property rights has hindered further development of agriculture and rural areas. For example, farmers cannot use land as collateral for accessing credit. It has also constrained an increase in farm size because farmers only have the right to use—but not to own—their land. The newly proposed Land Lease Law will allow farmers to sell and buy land use rights at market prices without interference from local villages and governments, but the legal framework to implement this policy has yet to be established. On the other hand, this new law may also increase the concentration of land ownership, and lead to large numbers of landless farmers or migrants in the urban centers. Without a sound social safety net, these landless people will fall into the poverty trap.

5.2. Reforming public institutions to serve small farms

In many Asian countries, small farms are still ignored by the government. For example, due to their limited land, it is difficult for small farms to access credit, marketing, and technology services. Given that investment in agricultural research has in the past also been biased against small farms, it is not surprising that larger farms adopted green revolution technology first. Small farms are often losers in the initial adoption stage of a new technology, since prices of agricultural products are pushed down as a result of the greater supply of products from large farms. To avoid losses for small farms in this initial stage, government may have to consider using limited subsidies on credit, inputs and new technologies, targeted to small farms. Once the new technology has been adopted, the subsidies should be removed gradually to avoid future efficiency losses.

5.3. Development of high-value commodities

Given the small size of farm holdings and limited labor movement out of the agricultural sector, land productivity must increase to increase labor

productivity and farmers' income. However, due to natural constraints, the potential to increase yields in traditional crops such as rice, wheat, maize, cotton, and rapeseeds is limited. In addition, international prices of these products are low due to oversupply and heavy protection in the developed countries. A possible solution is for farmers to diversify their farming activities and to engage in the production of high-value commodities. The government has much to do to facilitate this process.

First, the government must change its funding priorities in agricultural research from traditional crops such as rice and wheat to cash crops, livestock, and post-harvest technologies. It is still the case that many developing countries spend more than half of their agricultural research expenditures on staple crops (Fan et al., 2004).

Second, the government should gear up its public investments, or should design public policy to attract private investment in transportation, retail chain stores, processing, and storage. At present, governments spend a great proportion of public investments in traditional activities such as irrigation and large crop-extension programs.

5.4. Migration

Lack of economic and employment opportunities leads to migration, either to urban areas or rural areas in other parts of the country. During period of economic booms in Japan, South Korea, and lately China and Thailand, rural–urban migration not only improved the well-being of the migrants, but also improved the land-to-labor ratio in the agricultural sector, enabling nonmigrants to raise their labor productivity and income. For example, the increase in land-to-labor ratios in Japan and South Korea, and more recently in China, was the result of the net flow of rural labor to the urban and rural nonfarm sectors. However, today there are still formal and informal institutions and policy barriers to restrict these movements. Lack of education and access to information and infrastructure is the most critical constraint. In China, many jobs in the urban areas still require urban residence and farmers are not eligible for these jobs. Even if farmers are employed, their rights are usually not protected. In addition, social services such as health care, education of children, retirement, and unemployment benefits, to which the urban residents are entitled, are often not available to migrant farmers. All these restrictions and barriers should be removed to make large-scale migration possible.

5.5. Development of the rural nonfarm sector

Expanding off-farm employment is important for poverty alleviation. Hazell and Haggblade (1993) showed that the share of household nonagricultural income is inversely related to farm size, with landless and near-landless workers deriving between a third and two thirds of their income from off-farm sources. In India, Dev (1986) indicated that the bulk of the poor are landless or live on small farms with inadequate land to meet their own food needs. Consequently, they depend heavily on earnings from supplying unskilled wage labor to other farms or to nonfarm enterprises. Moreover, public investment in physical infrastructure (road, transportation, communication) as well as in education and health is crucial for the small farms to establish their own businesses and to access nonfarm jobs in the rural nonfarm sector.

6. Conclusion

Poverty remains essentially a rural phenomenon in Asia and most of the rural poor depend on farming for their livelihood. Agricultural production typically takes place on small holdings in the region. Moreover, the number of small farms has been increasing over time due to land fragmentation. Therefore, small-scale agriculture plays an important role for food security and poverty alleviation.

It has been argued that an inverse relationship exists between farm size and productivity. The validity of this claim and the factors causing it have been thoroughly researched. However, the empirical literature has failed to reach a consensus. The relationship between farm size and productivity appears to depend on a number factors including the difference in the intensity of land use, land fertility, and managerial factors. The viability of small-farm production is now being questioned with the ongoing process of trade liberalization, which places small farms in a disadvantaged position.

A number of policy options have been proposed to help small-scale farmers who face increasing globalization. Reforming land policies, for example, is crucial to secure property rights to farmers and to increase farm size. Equally important is the reform of public institutions in order to help small farmers have access to credit, marketing, and technology. Moreover, promoting diversification toward the production of high-value commodities can play an important role in raising smallholders' income. Finally, policies that facilitate urban–rural migration and that promote the development of the rural nonfarm sector are essential to help alleviating poverty among small-farm households and among the rural poor in general.

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