

Farm Size and Productivity: Understanding the Strengths of Smallholders and Improving Their Livelihoods

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During the 1960s and 1970s there was an intense debate on the observed inverse relationship between farm size and per hectare agricultural productivity in India. It was subsequently argued that the higher productivity of smallholdings would disappear with the adoption of superior technology, modernisation and growth in general. However, close to half a century later, National Sample Survey data from the initial years of the 21st century show that smallholdings in Indian agriculture still exhibit a higher productivity than large holdings. These smallholdings however show lower per capita productivity and the incidence of poverty is widespread. Strategies for Indian agriculture and smallholding households should include reducing the inequality in land distribution and promoting off-farm work in the rural areas itself. The strategy of improving the crop land-man ratio by facilitating migration from rural India has not worked and will not work. The lives of smallholding families can be improved only by building on their higher per acre agricultural productivity and by promoting off-farm rural employment.

The relationship between farm size and productivity has been intensely debated in India. A large number of studies during the 1960s and 1970s provided convincing evidence that crop productivity per unit of land declined with an increase in farm size (Sen 1962, 1964; Mazumdar 1965; Khusro 1968; Hanumantha Rao 1966; Saini 1971; Bardhan 1973; Berry 1972) which provided strong support for land reforms, land ceiling and various other policies to support smallholders on ground of efficiency and growth. Subsequently, various analysts started exploring reasons or factors for higher productivity of smallholders (Berry and Cline 1979; Bhalla 1979; Binswanger and Rosenzweig 1986; Dong and Dow 1993; Frisvold 1994; Raghendra et al 2000) and some of them even questioned the inverse relationship between farm size and productivity.

Bhalla and Roy (1988) observed that the inverse relation between farm size and productivity weakened and disappeared when soil quality variable was included in their study. Chadha (1978) analysing farm level data for three agro-climatic regions in Punjab for 1969-70, reported that the inverse relationship had ceased to hold in more dynamic zones. Ghose (1979) argued that an essential precondition for the existence of the inverse relationship phenomenon is technical backwardness implying that with the advances in technology the inverse relationship will vanish. Similar to this, Deolalikar (1981) observed that the inverse size-productivity relationship cannot be rejected at low levels of agricultural technology in India, but can be rejected at higher levels. Rudra (1968) concluded that "there is no scope for propounding a general law regarding farm size and productivity relationship". Chattopadhyay and Sengupta (1997) in the context of West Bengal, reported that the inverse relation between farm size and productivity was stronger in agriculturally developed regions. On the other hand, Hanumantha Rao (1975) and Subbarao (1982) reported a positive relationship between farm size and productivity and attributed this to higher application of fertiliser and other cash-intensive inputs on large farms.

Dyer (1997) argued that the inverse relationship is neither a product of superior efficiency on the part of small farms nor is it due to better quality land on the small farms but arises from the desperate struggle for poor peasants for survival on below subsistence plots of land. Hence, Dyer (1997) opined that redistribution of land on the basis of the inverse relation argument, far from alleviating poverty and creating employment opportunities, will only deepen and perpetuate extreme levels

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of exploitation and poverty. Foster and Rosenzweig (2010) using plot level panel data (over the span 1999-2008), of the Rural Economic Development Survey (REDS) data of the National Centre for Agricultural Economics and Policy Research (NCAER), and using a model incorporating supervision costs, risks, credit-market imperfections and scale economies associated with mechanisations, report that small-scale farming is inefficient in India. Thapa and Gaiha (2011) using all India survey, REDS, 2006 of NCAER data, analysed the farm size crop yields relationship, using the Kernel density function, and observed that the relation varies with food commodity group. They also report that “while much lower fractions of smallholders are concentrated in lower ranges of yields compared with medium- and large-landholders, segments of smallholders also obtain very low yields”.

Fan and Connie (2005) show that to increase labour productivity, and therefore, farmer’s income, either land productivity has to increase or land to labour ratio has to improve. Given the consensus that smaller farms have a lower land-labour ratio than large farms, Dyer (1997) and Havnevik and Skarstein (1997) argue that smaller farms enjoy higher land productivity in the short term, but over the long-term land productivity tends to drop. They argue that this long-term drop in land productivity results from over intensive cultivation of the land in order to maintain labour productivity, when more and more people need to survive on the same small area of farmland, and as the smaller farms are resource-poor to invest in preserving soil fertility, soil productivity eventually becomes exhausted and land productivity drops. A similar reasoning is given by Hazell (2011) who also maintains that many of the advantages of smallholders disappear as countries develop. The reasoning given for this is that as the per capita income rises, the economy diversifies and workers leave agriculture and the wage rate goes up. It then becomes more efficient to have progressively larger and more mechanised farms.

This debate has assumed a renewed importance in the wake of the changes brought about by technological change, liberalisation, commercialisation and further divisions of landholdings. Further, the structural transformation of Indian economy has not helped to move any sizeable population of cultivators to non-agricultural occupations. The share of agriculture and allied sectors in the gross domestic product (GDP) stands at less than 20%, whereas more than 50% of workforce is still engaged in agriculture. Because of these imbalances in structural change in output and occupations, the disparity between per worker income in agriculture and non-agriculture has sharply increased.¹ As this disparity in agriculture and non-agriculture has been accompanied by a slowdown in the growth rate of agriculture after the mid-1990s (Chand 2010) it has put serious strain on the income and livelihood of smallholders. Against this background, the present study revisits the debates on farm size and agriculture productivity to suggest policy measures to address the twin problems of raising productivity and growth of agriculture as well as improving income and livelihood of smallholders in agriculture who constitute more than 80% of total farming households, 50% of rural households and 36% of total households in India.

The study is organised into six sections. Section 1 presents a brief picture of smallholders at the global level and discusses whether rapid economic growth in Asia has led to a trend towards larger size holdings as has been the experience of western economies. Section 2 is devoted to changes in the structure of landholdings in India. Section 3 presents empirical evidence on changes in input use, adoption of improved technology and crop intensity during last three decades by size class. This is followed by a discussion on the relationship between farm size and productivity based on the aggregate of all crops in the recent period. Section 4 highlights the need to harness the strength of smallholders based on the recent evidence and explores ways and means to improve their livelihood. The conclusions of the study are presented in the last section.

Table 1: Changes in Farm Size after 1970 in Selected Countries

Country	Period I		Period II	
	Year	Farm Size (ha)	Year	Farm Size (ha)
Canada	1971	187.6	2001	273.4
US	1969	157.6	2002	178.4
Brazil	1970	59.4	1996	72.8
Peru	1971-72	16.92	1994	20.1
Denmark	1970	20.9	2002	52.3
France	1970	22.07	1999-2000	45.0
Italy	1970	6.9	2000	7.6
Netherland	1970	11.6	1999-2000	22.0
Norway	1969	17.6	1999	89.5
Spain	1972	17.83	1999	23.9
Australia	1970	1920.3	2001	3232.1
India	1971-72	2.3	1995-96	1.4
Japan	1970	1.0	2000	1.2
Korea Rep	1970	0.88	2000	1.0
China	Not available		1997	0.6

Source: *Fertiliser Statistics 1980-81 and 2009-10*, Fertiliser Association of India, New Delhi (original source is mentioned to be *FAO Production Yearbook* and various other publications of FAO).

1 Structure of Agriculture Holdings: Global Picture

Globally, there are about 525 million farms out of which smallholdings of less than two hectares (ha) constitute 85% (Oksana 2005). Out of this 87% of smallholding farms are located in Asia, followed by Africa (8%). The rest 5% smallholdings are located in Europe and America (ibid). In Asia, China stands first in concentration of smallholdings followed by India, Indonesia, Bangladesh and Vietnam. The number of small farms in China in 1997 was 189.4 million accounting for 47% of smallholders in the world.

It has been hypothesised in some studies by Hazell (2011) that many of the advantages of smallholders disappear as countries develop and it becomes more efficient to have progressively larger and more mechanised farms. This type of change has been experienced in western economies where economic transformation has been associated with an increase in the size of holdings with a near obliteration of smaller farms. The movement towards larger size holdings has continued even in the recent past in western economies. However, as can be seen from Table 1, the experience of Asia has been totally different from the western economies. During the three decades after 1970, farm size in the United States (US) and Canada increased from 157 and 187 ha, respectively to 178 ha and 273 ha.

Denmark, France and Netherland have seen a doubling of farm size since the early 1970s. Latin American countries like Peru and Brazil also show a similar type of change in the structure of holdings as witnessed in western economies. In contrast to this, the concentration of smallholders has remained very high in Asia, with an average farm size in Japan, which is a developed country, Korea and China remaining below 1.2 ha. Farm size in India in the same period has declined from 1.84 ha to 1.32 ha.

Table 2: Farm Size, Productivity, Agriculture Growth and Poverty in China and India

Particular	China	India
Average farm size, recent year: ha	0.6	1.21
Productivity/ha Kg 2008		
Paddy	6,556	3,370
Wheat	4,762	2,802
Maize	5,556	2,324
Groundnut	3,102	1,071
Sugar cane	73,114	68,877
Soyabean	1,703	1,042
Average annual agriculture growth rate (%):		
	1990-2009	4.1 3.2
	2000-09	4.4 2.9
Poverty based on \$1 per capita daily income based on PPP 2005 (%):		
	1981	84.0 59.8
	2005	15.9 41.6

Sources: (1) FAOSTAT. (2) *World Development Indicators 2010*, World Bank. (3) *Selected Indicators of Food and Agricultural Development in the Asia Pacific Region, 1995-2005*, RAP Publication 2006/16, FAO RAP, Bangkok.

Table 3: Changes in Share of Smallholders in Number and Area of Operational Holdings at All India Level (%)

Year	Share in No of Landholdings			Share in Operational Area		
	Marginal (< 1 ha)	Small (1-2 ha)	Sub total (< 2 ha)	Marginal (< 1 ha)	Small (1-2 ha)	Sub total (< 2 ha)
1970-71	51	19	70	9	12	21
2005-06	65	19	83	21	21	42

Source: Agricultural Census 2000-01 and 2005-06, Department of Agriculture and Cooperation, GOI.

These trends show that changes in the structure of landholdings in Asia did not follow the trend witnessed in advanced western countries. The experience of China is particularly interesting for India. China continues to have a much lower size of landholding than India but its agricultural productivity and growth are significantly higher than India. Between 2000 and 2009, China recorded 4.4% annual growth in GDP agriculture compared to 2.9% in India. Per hectare productivity of major crops in China is 6% to 190% higher than India (Table 2). Similarly, China's productivity in all the crops except soybean is much higher than the average productivity in the world. China also has high concentration of workforce in agriculture, like India, but this has not come in the way of improving the livelihood of smallholders and the rural population. The country has reduced the level of poverty (based on the World Bank measure of per day income of \$1.25 in terms of purchasing power parity of year 2005) from 84.0% to 15.9% between 1981 and 2005. Compared to China, India's record in reducing poverty has been dismal. The incidence of poverty in India in the year 1980 based on the norm of \$1.25 per day per person income was much lower than China (59.8%) but in the next 25 years India's poverty level turned out to be much higher than China (Table 2). China's experience shows that there are ways to eliminate poverty even with high concentration of workforce

in agriculture and predominance of marginal holdings. The experience of China also offers some interesting lessons for India's policy towards smallholders. Tiny size of holding did not constrain the attainment of high level of productivity and growth of agriculture sector. Second, unlike developed countries in the west, the farming population in Asia has a strong preference to hold agricultural land. It is thus imperative to look for ways and means to improve productivity and livelihood of smallholders without worrying too much about the size of holdings per se.

2 Structural Changes in Landholdings in India

Between 1970-71 and 2005-06, the total number of operational holdings in India increased from 71.01 million to 128.89 million and operational holdings area declined from 162.18 million ha to 156.62 million ha. This resulted in the reduction of average farm size from 2.28 ha to 1.21 ha. In the same period, the share of small and marginal holdings in operated area doubled. Smallholders now cultivate 42% of operated land and constitute 83% of total landholdings (Table 3).

The growth in rural population is the main factor underlying an increase in number of holdings in India. It is interesting to point out that since 1970-71, both the number of landholdings and rural population increased exactly at the same rate (1.76%). This broadly reflects the outcome of inheritance pattern prevalent in India.

3 Input Use and Productivity

Most of the studies on relationship between farm size and productivity are based on one or two most important crops grown by the farmers. This is not consistent with the behaviour of producers who do not seek to optimise returns from one or two crops – they optimise returns from a complete set of crops grown on the farm. Therefore, we have estimated productivity and input use in all the crops grown by farmers on an annual basis and used these to compare performance of the entire system of land-based activities across farm size categories. In Indian agriculture, the overall productivity of a farm depends on the use of yield enhancing inputs like fertiliser, access to irrigation, technology, crop intensity and choice of crops (crop pattern) grown at the farm. Therefore, it is pertinent to examine variations in these factors to understand the variation in productivity across farm size categories.

3.1 Access to Irrigation

Data on area under irrigation is available both in the agricultural census as well as the All India Input Survey which is conducted in the year following the census. Since the census data enumerate all landholdings in the country, the information available in the census is considered better than that in the Input Survey as the latter is based on a sample, though it is a large sample. Results of all India Agricultural Census show that the area under irrigation as a percentage of area under cultivation was historically higher at lower farm size categories. During 1980-81, 40% of the area under the marginal category and one-third of the area under the small size

category was under irrigation (Table 4). Compared to this, medium- and large-holdings had irrigation facility only on 24% and 16% of the area, respectively. Size advantage in access to irrigation continued in the subsequent period though the variation across the size category declined. During 2000-01, which is the latest published information from the agriculture census, more than half of the area under cultivation in marginal holdings was irrigated. Irrigation coverage on smallholdings was 39%. As landholding increased, the percentage of area under irrigation decreased. Large-sized farms with holding size more than 4 ha applied irrigation on 31% net sown area.

3.2 Fertiliser Use

Fertiliser consumption per hectare of net sown area on different size categories of farms is presented in Table 5. During 1981-82, marginal farmers applied 55 kg fertiliser per hectare of area which was double the fertiliser use in large-size farm holdings. Input surveys during 1991-92 and 2001-02 show that fertiliser use per hectare of area remained the highest in the bottom category of farm size and it declined with an increase in farm size. During 2001-02 marginal farmers used 2.6 times the fertiliser used by large farmers. Similarly, average fertiliser use at smallholding (1 ha to 2 ha) was 90% higher than large holdings.

It was further investigated whether smallholders made higher use of fertiliser because of higher coverage of irrigation. This was done by looking at fertiliser use per hectare of irrigated land and unirrigated land. As it can be seen from Table 5, the disparity in fertiliser use across size categories was much higher in unirrigated land than in irrigated land. Compared to large size holding, marginal and small farms used 47% and 20% more fertiliser per unit area on irrigated land and 336% and 245% higher fertiliser on unirrigated area in the year 2001-02. Further, the relative difference in fertiliser use between irrigated and unirrigated land was lowest at marginal farms and highest at large farms. These results show that as the farm size declined, use of fertiliser per hectare of land increased even under unfavourable conditions. This relationship is found to have remained intact over time.

3.3 High-yielding Varieties

Adoption of high-yielding varieties (HYVs) have been a major source of increase in agriculture productivity in the country. Data on adoption of HYVs at farms of various size categories is available only for years 1996-97 and 2001-02. As the adoption of HYVs is strongly associated with irrigation, area coverage under HYVs by size categories is presented for total land as well as according to irrigation status (Table 6). During 1996-97, 59% area under marginal, 55% under small and 53% to 54% under semi-medium and medium farms was under HYVs. On large farms HYVs occupied 42% of the area. In the next five years the HYV coverage on marginal and smallholdings increased to 72% and 68%, but their coverage on large farms remained below 50%. The difference in adoption of HYVs between large and other categories was much larger on unirrigated land than on irrigated land.

3.4 Crop Intensity

Crop intensity is a major source of productivity increase and agriculture growth in the country. Back in 1981-82 more than one crop was grown only on one-fourth of the area. During the two decades since then, crop intensity increased from 124% to 128% (Table 7). Three points of the Input Survey show that crop intensity remained the highest in marginal holdings and declined with an increase in farm size. In the latest year of the Input Survey marginal farmers took a second crop on 39% area compared to 25% and 21% on medium and large holdings.

Table 4: Extent of Area under Irrigation in Different Farm Size Categories (%)

Year	Marginal	Small	Semi-medium	Medium	Large	All Categories
1980-81	40	33	29	24	16	27
1990-91	44	36	33	30	22	33
2000-01	51	39	37	36	31	39

Source: Agricultural Census, 1980-81, 1990-91 and 2000-01.

Table 5: Fertiliser Consumption Per ha of Net Sown Area according to Farm Size Class (kg)

Year	Marginal	Small	Semi-medium	Medium	Large	All Categories
Total area						
1981-82	55	48	42	36	27	40
1991-92	99	85	77	68	54	76
2001-02	175	129	112	95	68	119
Irrigated area						
1981-82	100	98	99	97	101	99
1991-92	145	140	147	144	157	146
2001-02	252	206	190	174	171	203
Unirrigated area						
1981-82	24	22	18	14	9	16
1991-92	58	48	39	32	19	38
2001-02	96	76	63	46	22	61

Source: Input Survey, Ministry of Agriculture, GOI. Respective issues.

Table 6: Share of Area under HYV in Different Categories of Farms

	Marginal	Small	Semi-Medium	Medium	Large	All size
Irrigated						
1996-97	80	76	76	76	75	77
2001-02	89	86	85	82	78	85
Unirrigated						
1996-97	37	37	38	36	25	35
2001-02	52	54	52	46	30	48
Total						
1996-97	59	55	54	53	42	54
2001-02	72	68	65	61	47	64

Source: Input Survey, Ministry of Agriculture, GOI, respective Issues.

Table 7: Cropping Intensity on Farms of Different Size Categories (%)

Year	Marginal	Small	Semi-medium	Medium	Large	All Categories
1981-82	134	128	125	120	116	124
1991-92	137	130	124	121	118	126
2001-02	139	128	126	125	121	128

Source: Input Survey, Ministry of Agriculture, GOI. Respective issues.

Table 8: Share of Different Crop Groups in Total Cropped Area (%)

Crop Group	Marginal	Small	Semi-Medium	Medium	Large	All Categories
Cereals	69	61	53	56	50	58
Pulses	7	10	12	11	13	10
Sugar crops	3	3	2	3	1	3
Spices and condiments	1	1	1	1	1	1
Fruits	1	1	1	1	1	1
Vegetables	3	2	1	2	1	2
Oilseeds	9	12	16	14	14	13
Fibres	4	7	7	7	6	6

Source: Input Survey, Ministry of Agriculture, GOI. Respective issues.

These results show that small and medium holders in India have been making much more intensive use of land compared to upper size categories.

3.5 Cropping Pattern

The area allocated to various types of crops by farmers in different size categories is presented in Table 8 (p 8). Cereals dominate the cropping pattern in all size categories but follow a declining trend with an increase in the size of holding. All other crop groups show a mixed size pattern. The area allocated to vegetables was higher in the marginal size category compared to any other size class. These results show that the production of staple food is a dominant consideration in all size categories. This is partly due to factors on the demand-side and partly due to consideration of family requirement. Cropping pattern is an

Table 9: Agricultural Output Per Household, Per Hectare and Per Capita in Different Farm Size Categories

Farm Size Class (ha)	Household Size: Number	Per Capita Land (ha)	Output Value (Rs)		
			Per Household	Per Capita	Per Ha
0.01-0.4	5	0.04	4,783	965	25,173
0.4-1	5	0.12	12,563	2,364	18,921
1.01-2	6	0.24	23,292	3,801	16,780
2.01-4	6	0.43	40,403	6,734	15,091
4.01-10	7	0.82	77,120	10,588	13,564
>10	8	2.20	1,37,473	16,782	7,722
All	6	0.22	18,858	3,143	15,426

Source: *Situation Assessment Survey*, NSSO 59th Round, Report No 497.

important determinant of total productivity of all crops, but total production also depends upon productivity of individual crops. The combined effect of these two is discussed in the next section.

3.6 Farm Size and Productivity

The information presented in the previous sections on fertiliser use, irrigation, crop intensity, and technology clearly indicate that all of them decline with an increase in farm size – lower the size of holding, higher was the use of inputs, crop intensity and coverage under HYVs, reflecting technology. Obviously, the greater use of these factors would result in higher productivity, and those farm categories with the higher value of these factors are also expected to realise higher productivity. Incidentally, data on production is neither published in the agriculture census nor in Input Surveys conducted by the ministry of agriculture, Government of India, though these sources provide rich information on structure of holdings, input use, cropping pattern and related aspects in various farm size categories. Thus, the information available on input use and other variables and structure of holdings in the Input Survey and Agriculture Census cannot be used to establish the relationship between farm size and productivity. However, this type of information is available in the Situation Assessment Survey of Farmers conducted by the National Sample Survey Organisation in 59th round on “Income, Expenditure and Productive Assets of Farmers Households” which pertains to agricultural year 2002-03 (GOI 2005). The published report (No 497) provides data for seven farm size categories on expenditure on inputs like seed, fertiliser, pesticides, irrigation,

repair, labour, etc, and the output quantity and value per farmer household (Table 4, Report 497). However, this report does not provide data on average size of holding in each farm size category. These averages were computed from the unit level data available from NSSO. Value of output per household was divided by average size of holding to arrive at the value of output per hectare for various size classes.

The results indicate that land productivity was inversely related to farm size class (Table 9). Per hectare value of crop output was Rs 25,173 at holdings below 0.4 ha and Rs 18,921 at holdings of size 0.4 ha to 1 ha. As the farm size increased towards 2 ha, productivity declined to less than Rs 17,000 per hectare. In large farms (4 ha to 10 ha) the value of aggregate crop production declined to Rs 13,500 per hectare. Farmers operating on landholdings above 10 ha (the very large size category) were found to have very low productivity (Rs 7,722) which was about half of the productivity at large holdings and less than one-third of the productivity in the bottom farm size category. Agriculture productivity in marginal and smallholdings was found to be much higher than the average productivity for all size categories.

The above results clearly indicate the inverse relationship between farm size and land productivity. Per capita output is low on smallholdings despite higher productivity due to lower per capita availability of land.

Table 10: Estimation of Farm Income Derived from CSO Data at 2004-05 Prices

Particular	Average 2007-08 and 2008-09 Amount (Rs)
1 Gross value of agriculture output/hectare of net sown area	52,191
2 Gross value of inputs other than labour/ha of NSA	14,663
3 Cost of hired labour @	4,251
4 Farm family income /ha 1-2-3	33,277
5 Farm family income/capita assuming five persons/farm household	6,655
6 Poverty line income for rural population:	
Planning Commission	4,276
Tendulkar Committee	5,360
7 Breakeven farm size (ha) to keep above poverty line based on:	
Planning Commission	0.642
Tendulkar Committee	0.805

@ Based on NSSO (2005) ratio of cost of hired labour to costs of inputs is 0.29:1.

Source: *National Accounts Statistics 2010*, CSO, Gol.

4 Strength of Smallholders and Their Livelihood

The results from the nationwide surveys of farm households presented above clearly show that the lower size of holdings in India have been using higher doses of inputs, making more intensive use of land and adopting new technology on a much larger scale compared to farms in the larger size categories. These patterns of negative association between farm size and productivity enhancing variables have not diluted over time with the advancement of technology or modernisation of agriculture. The negative relationship between farm size and aggregate productivity is quite pronounced even in the recent years. It seems that emerging changes in labour market and the rising demand for labour will further increase advantage of smallholders over large size holdings. The much vaunted scale advantage has not provided any edge to larger size holdings, nor has it constrained production in marginal and smallholdings. On the contrary, the available

evidence suggests that productivity of Indian agriculture will rise significantly if land inequality is reduced in favour of lower size holdings.

Despite a strong advantage in land productivity and much better production performance, smallholders earn an awfully low amount of income from agriculture on a per capita basis primarily due to very adverse land-man ratio (Table 9). Per capita availability of land in marginal holdings is merely 1,200 sq m and in smallholdings it is 2,400 sq m. There is a need to examine whether such a tiny piece of land can generate enough income to take care of the livelihood needs of a farm family? To find answer to this question we have prepared an estimate of income from farming by using the Central Statistical Organisation (CSO) data on the value of output and inputs for the latest year. The calculations are presented in Table 10 (p 9).

The gross value of agriculture (crop + livestock) output in 2007-08 and 2008-09 was Rs 52,191 at 2004-05 prices,² while the gross value of inputs was Rs 14,663. The CSO does not report cost of labour which is needed to arrive at the income accruing to the farm family. The cost of hired labour was computed by using labour's share of cost reported in the NSSO Report 497, Table 4. After deducting the cost of inputs and hired labour, per hectare income of a farm family from agriculture comes to Rs 33,227 at 2004-05 prices. Taking into account the size of the family, the per capita income from agriculture per hectare of land comes to Rs 6,655. This income was compared against the Planning Commission norm of poverty line for rural areas which shows that a farmer operating less than 0.64 ha area will be under poverty. Based on the Tendulkar Committee norm, a minimum 0.8 ha of land area is needed to keep a farm family above the poverty line, if this family lives only on agricultural income. This implies that 62% of farmers in India, who own less than 0.80 ha of cultivable land, would be under poverty if they do not have an opportunity to earn income outside agriculture. This

figure is going to rise further with the ongoing division of landholdings.

It is thus clear that with the present level of productivity, three-fourths of the population of smallholders cannot meet their livelihood from farm income alone. There are mainly two ways to improve their income and livelihoods. One, an increase in the land-man ratio, which is possible only if a sizeable segment of smallholders is moved out of agriculture. Two, provide alternative sources of employment to smallholders in or around their habitation to supplement their farm income. The experience of past six decades in India and of China show that the strategy of raising the land-man ratio by shifting a sizeable number of farmers cultivators away from agriculture has not worked in the Asian context. Despite the rapid growth of the economy during the last three decades, the size of landholding in China is only 0.6 ha. Similarly, the acceleration in India's economic growth after the early 1990s could not check the growth in population of smallholders. Based on these experiences and those of in many other countries in Asia, the option of raising the income of smallholders by increasing the land-man ratio was not found workable. Another strong factor against the first option is that an increase in the size of landholdings involves lowers productivity. Therefore, India needs to take serious steps to create employment avenues for smallholder cultivators outside agriculture, but, within the countryside itself so that workforce in smallholder households partly works on the farm and partly outside farm. This model of development has helped China to improve livelihood and eliminate poverty in small farm households. India also needs to promote this kind of model which is quite capable of sustaining high levels of productivity and improving livelihoods.

5 Conclusions

Smallholders do not lag behind other farm size categories in adoption of improved technologies and use of fertiliser and

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irrigation. Moreover, marginal and smallholders make better use of inputs as revealed by the lower fertiliser imbalance index. Crop intensity, which is the main source of growth in agriculture in India was found to be the highest in marginal holdings and it declined with an increase in farm size. The inverse relationship between farm size and productivity based on the aggregate of all crops has been quite pronounced in the recent years. Advances in technology and the scale factor in production did not dilute the superior performance of lower size holdings. Various theories about disappearing advantages of marginal and small farmers and efficiency gains of large sized farmers with economic development are not found to be operating in Asian countries like India and China. Any move towards increasing farm size on considerations like non-viability of smallholders will adversely affect productivity and growth of Indian agriculture. The recent evidence on farm size and productivity provides strong support to reducing land inequality and lowering agricultural land ceiling limits to improve productivity and growth of Indian agriculture.

The study finds that while the small farm in India is superior in terms of production performance, it is weak in terms of generating adequate income and sustaining livelihood. Tiny holdings below 0.8 ha do not generate enough income to keep a farm family out of poverty despite high productivity. Nearly three-fourths of small farmers in India fall under poverty if they do not get income from non-farm sources. Raising income of such farmers, by relocating a sizeable chunk outside agriculture and thus raising the size of holdings had not worked in India and other major Asian countries. Another strong factor against this option is that an increase in the size of landholdings involves lower productivity. Serious steps should be taken to create employment avenues for smallholders outside agriculture, but within the countryside so that the workforce in small farms gets work and income from rural non-farm activities without leaving the farms. This seems to be the only way to achieve higher productivity and to sustain agricultural growth together with augmenting the income of smallholders for improved livelihood.

NOTES

- 1 Around 1980-81, income per worker in agriculture sector was close to one-third of the income of non-agriculture worker. The ratio of per worker income in agriculture to non-agriculture declined to one-fifth around 2000-01. With the ongoing trend in sectoral income and employment, one worker in agriculture will earn less than one-tenth of income of a non-agriculture worker.
- 2 Income was estimated at 2004-05 prices because poverty line income was available for this year.

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