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# Farmers' income in India: trends and prospects for future growth

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**Abstract** The Government of India aims to double agricultural income by 2022–23. This paper examines whether this target can be met—by analysing the trends in farmer income, sources, and factors of performance by farm class and state—and finds it unlikely. Income growth would be accelerated by improving resource use efficiency and access to agricultural extension, markets, and credit; and by diversifying towards high-value, high-growth sectors like animal husbandry and horticulture. To sustain income growth in the long term, greater resources must be allocated to agricultural research, and gainful employment opportunities must be created in the rural non-farm sector.

**Keywords** Farmers' income, income growth, diversification

**JEL codes** O47, P25, Q12, Q15, R11

The green revolution, a paradigm shift in the agricultural policy in India in the mid-1960s, emphasized the large-scale diffusion of biochemical technologies, including high yield varieties of seeds and chemical fertilizers. Agricultural productivity and food supplies increased significantly; the production of food grains grew from 72.35 million metric tons (MT) in 1965–66 to 176.39 MT in 1990–91, and to 285 MT in 2018–19, and milk production, too, rose from around 20 MT in the 1960s to almost 188 MT in 2018–19. Such phenomenal growth in food production made India food-secure, reduced its import dependence, improved nutritional outcomes, and alleviated poverty (Ravallion and Datt 1996; Datt et al. 2016). However, the distributional benefits of technological progress have been asymmetrical across populations and regions, primarily because agricultural policy aimed to improve the national food security and initially targeted the regions that had greater potential for producing staple foods (wheat and rice). The technological revolution bypassed the less endowed rain-fed regions, which were diversified towards coarse cereals, pulses, and oilseeds (Das and Barua 1996; Fan et al. 2000), and its benefits, being proportional to landholding size, were expropriated mainly by relatively large farm households.

Another dimension of the income distribution is the disparity between agricultural and non-agricultural populations. The labour productivity gap between agricultural and non-agricultural populations has widened to the disadvantage of agricultural populations from just 30% in 1970–71 to 75% in 2015–16 (Birthal 2019). Within the rural sector, too, the income gap between cultivators and non-agricultural workers increased. The farm income per cultivator, 34% of a non-agricultural worker's income in the 1980s, fell to 25% after 1993–94 (Chand 2017); at present, a farmer earns only 20% of the national per capita income (Birthal et al. 2017). The income disparity between agricultural and non-agricultural sectors and within the agricultural sector is growing, and it is a matter of serious policy concern; if not reversed, it may have serious socio-political and economic consequences.

At the same time, Indian agriculture has been facing several challenges, such as diminishing farm size, decelerating productivity growth, rising input costs and price volatility, and climate change. Past policies helped

to achieve food security, but at the cost of degradation of natural resources, especially the groundwater and soils. The frequency of extreme climatic events has increased, and it is predicted to rise further in the plausible future climate scenario (Field et al. 2012). Agrarian distress is growing; a large proportion of smallholder farmers would like to quit agriculture but cannot because the alternative income opportunities are few (Birthal et al. 2015). Agriculture's share in the gross domestic product (GDP) has fallen significantly, but it still engages almost half the workforce.

Improving farmers' income, and not food production alone, indicates another paradigm shift in agricultural policy. In 2016–17, almost half a century after the green revolution, the Government of India targeted this goal by 2022–23. This commitment has been reiterated several times and widely discussed in the academic and policy debates. The critics argue that doubling farmers' income in such a short period is impossible (Chand et al. 2015; Satyasai and Bharti 2016). The counterargument is that if the strategies are differentiated by region, and appropriately targeted to the populations and regions that lag behind in agricultural development in particular and economic development in general, the challenge, though difficult, is not unsurmountable (Birthal et al. 2017).

This paper explores the challenges to, and prospects of, improving farmers' incomes along several dimensions, including landholding size, income sources, social affiliation, education/skills, and access to technology, information, and credit. The findings are likely to be useful to policymakers in formulating regionally differentiated strategies for enhancing income and allocating resources optimally.

## Data sources

In this paper, we have used data from two large-scale surveys conducted by the National Sample Survey Office (NSSO): the Situation Assessment Survey of Farmers, 2002–03, which covers 51,770 farm households from 6,638 villages in India, and the Situation Assessment Survey of Agricultural Households, 2012–13, which covers 35,200 farm households from 4,529 villages (NSSO 2003, 2013). These surveys provide information on various socio-economic aspects of farm households, including income sources. These surveys define 'farm household' differently (Sarkar 2017): in 2002–03 farm households were classified by land ownership, but in 2012–13 they were based on a minimum farming income of INR 3,000. To ensure that the data is comparable, only the farm households possessing land were considered, and the final sample of households numbered 50,522 in 2002–03 and 34,296 in 2012–13.

Farm household income has been classified into income from crop cultivation, animal husbandry, wages and salaries, and non-farm business enterprises. The income from crops was estimated as the value of main and by-products minus the cost of inputs. The income from animal husbandry was estimated as the income from sale of live animals or livestock products minus costs incurred. The income earned as labourers (outside their households) in agriculture or non-farm enterprises was classified as income from wages and salaries. The net income from non-farm business enterprises falls in the last income category.

## Landholding size and income sources

Indian agriculture is dominated by small holdings of less than 2 hectares (ha); their proportion has risen from 83% in 2002–03 to 87% in 2012–13 (Table 1), and the proportion of marginal holdings (<1 ha) from 65% to 70%. The average size of marginal and small holdings remained the same, but the average size of large holdings declined from 7.52 ha to 6.60 ha. On the whole, the average size of holdings declined by almost 15%, from 1.22 ha to 1.03 ha, during this period. The declining size of operational holdings, and the rising proportion of small landholdings, constitute a cause of concern for the livelihood of a large rural population.

Table 2 presents the growth in income by source. The annual household income grew at 3.7% per annum, from INR 53,330 to INR 77,283, from 2002–03 to 2012–13 (at 2012–13 prices). The growth was not uniform, however; the income from animal husbandry increased at 13.2% per annum, followed by agricultural wages (6.4%) and crop husbandry (4.3%). Non-farm wages declined by 2.9% a year, while non-farm business income remained almost stagnant. The income of marginal farm households increased by 2.9% per annum, compared to 6–7% for medium and large farm households (Table 3). The slow growth in income during this period was accompanied by an increase in inequality. The annual increase in income from crops

**Table 1 Size distribution of land holdings in India**

| Farm class | 2002–03 | | 2012–13 | |
|---|---|---|---|---|
| | Average size (ha) | Households (%) | Average size (ha) | Households (%) |
| Marginal (<1.00 ha) | 0.41 | 65.47 | 0.42 | 69.63 |
| Small (1–2 ha) | 1.37 | 18.18 | 1.39 | 17.13 |
| Medium (2–4 ha) | 2.63 | 10.63 | 2.59 | 9.18 |
| Large (>4 ha) | 7.52 | 5.71 | 6.60 | 4.05 |
| Overall | 1.22 | - | 1.03 | - |

**Table 2 Distribution and changes in farm household income in India (at 2012–13 prices, INR/household/annum)**

| Income source | 2002–03 | 2012–13 | Compounded annual growth (%) |
|---|---|---|---|
| Crop husbandry | 24,135 (45.3) | 37,017 (47.9) | 4.3 |
| Animal husbandry | 2,493 (4.7) | 9,300 (12.0) | 13.2 |
| Agricultural wages | 8,022 (15.0) | 15,269 (19.8) | 6.4 |
| Non-agricultural wages | 12,735 (23.9) | 9,489 (12.3) | -2.9 |
| Total wages (agricultural and non-agricultural combined) | 20,757 (38.9) | 24,758 (32.0) | 1.8 |
| Non-farm business activities | 5,944 (11.1) | 6,206 (8.0) | 0.4 |
| Total income | 53,329 (100.0) | 77,283 (100.0) | 3.7 |

*Note* Figures in parentheses represent the percentage of total income.

and animals, and also wages and salaries, was the highest for large households and the lowest for marginal households.

Social status—based on caste, religion, and ethnicity—might have significant influence on household income because the early adopters of technologies and innovations, with better resource endowments and access to extension services, usually belong to the upper strata of society (Batte and Arnholt 2003; Ali 2012; Kumar 2013; Birthal et al. 2015). Our findings reveal that the landholdings of Scheduled Caste (SC) households are almost half the size of that of upper caste households (Table 4). Scheduled Tribe (ST) and Other Backward Class (OBC) households, too, have smaller landholdings.

Further, in 2002–03, the annual income of a SC household was almost 40% less than that of an upper caste household, and the gap widened slightly in 2012–13. The income of SC households increased annually at 2.4%, less than the 3–5% annual increase for other castes (Table 5). The most striking feature is the decline in non-farm wages and business activities for SC and ST households.

## Regional variation

The regional variation in income levels and growth is huge (Table 6). The household income declined in West Bengal, Bihar, Arunachal Pradesh, Mizoram, and Uttarakhand between 2002–03 and 2012–13, but it was almost stagnant in Assam and Sikkim. Many low-

**Table 3 Distribution and changes in household income across various size categories in India (at 2012–13 prices)**

(INR/household/annum)

| Income source/ Size category | Marginal (<1 ha) | | | Small (1–2 ha) | | | Medium (2–4 ha) | | | Large (≥4 ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | Compounded annual growth (%) | 2002–03 | 2012–13 | Compounded annual growth (%) | 2002–03 | 2012–13 | Compounded annual growth (%) | 2002–03 | 2012–13 | Compounded annual growth (%) |
| Crop production | 10,837 | 16,787 | 4.5 | 29,762 | 50,837 | 5.5 | 52,874 | 90,626 | 5.5 | 105,144 | 204,604 | 6.9 |
| Animal husbandry | 2,471 | 7,878 | 12.3 | 2,645 | 10,015 | 14.2 | 2,133 | 14,410 | 21.0 | 2,918 | 19,118 | 20.7 |
| Wages and salaries | 23,176 | 26,422 | 1.3 | 16,671 | 20,845 | 2.3 | 16,657 | 19,905 | 1.8 | 13,666 | 23,714 | 5.7 |
| Non-farm business activities | 6,121 | 5,589 | -0.9 | 4,655 | 7,208 | 4.5 | 4,463 | 6,595 | 4.0 | 10,766 | 11,683 | 0.8 |
| Total household income | 42,607 | 56,679 | 1.9 | 53,735 | 88,906 | 5.2 | 76,129 | 131,538 | 5.6 | 132,495 | 259,120 | 6.9 |

*Note* The growth rates represent the compounded annual growth from 2002–03 to 2012–13.

**Table 4 Average landholding size (ha) across social classes in India**

| Caste group | Year | |
|---|---|---|
| | 2002–03 | 2012–13 |
| ST | 1.19 | 1.01 |
| SC | 0.75 | 0.65 |
| OBC | 1.23 | 1.04 |
| Upper castes | 1.55 | 1.31 |

income states performed better than high-income states, changing the inter-state dynamics of farm household income. Arunachal Pradesh was at the top of the income hierarchy in 2002–03 and Odisha at the bottom; the ratio of their incomes was around 5.9. In 2012–13, Punjab emerged at the top and Bihar at the bottom; the ratio of their incomes was nearly 5. The gap between the poorest and richest states narrowed during this period, a welcome development. Between 2002–03 and 2012–13, the income rankings improved for Bihar, West Bengal, Uttarakhand, Jharkhand, Uttar Pradesh, Assam, Sikkim, Mizoram, and Arunachal Pradesh, while the rankings of other states fell.

The changes in farm household income across different states in India between 2002–03 and 2012–13 may be explained largely by the changes in income from crop production and income from animal husbandry. The annual growth in income from crop production was almost 6% or higher in most of the states (14) where income growth was higher than the all-India average (Table 7). Such growth was more than 9% per annum in Odisha and Chhattisgarh and more than 10% per annum in Rajasthan. The growth in household income was lower than the all-India average but positive in eight states; in these states, the growth in income from crop production was either very low or negative.

The annual increase in income from crop production exceeded 4% in Maharashtra and Uttar Pradesh, but it was negative in most other states (Nagaland, Jammu and Kashmir, Jharkhand, and Sikkim). The income from crop production declined considerably in all the states (except Arunachal Pradesh) where the farm household income declined between 2002–03 and 2012–13. Clearly, increasing the income from crop production is a prerequisite for accelerating growth in farm household income in India.

**Table 5 Household income across social groups in India**

| Caste group | Average annual income (INR/household/annum) | | Compounded annual growth (%, 2002–03 to 2012–13) |
|---|---|---|---|
| | 2002–03 | 2012–13 | |
| Scheduled tribes | 43,793 | 70,428 | 4.9 |
| Scheduled castes | 43,074 | 54,824 | 2.4 |
| Other backward castes | 49,428 | 76,758 | 4.5 |
| Upper castes | 70,684 | 96,736 | 3.2 |

**Table 6 Changes in household income across different Indian states**

| State | Annual income (INR/household) | | Compounded annual growth (%) | State | Annual income (INR/household) | | Compounded annual growth (%) |
|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | | | 2002–03 | 2012–13 | |
| Odisha | 25,360 (27) | 59,624 (22) | 8.9 | Nagaland | 84,388 (8) | 120,764 (7) | 3.6 |
| Rajasthan | 45,552 (21) | 88,662 (14) | 6.9 | Maharashtra | 62,849 (16) | 88,872 (13) | 3.5 |
| Madhya Pradesh | 38,203 (24) | 74,740 (18) | 6.9 | Uttar Pradesh | 42,256 (22) | 59,308 (23) | 3.4 |
| Haryana | 89,498 (7) | 173,219 (2) | 6.8 | Meghalaya | 106,299 (5) | 141,961 (5) | 2.9 |
| Tripura | 35,754 (26) | 65,256 (20) | 6.2 | Jammu & Kashmir | 121,369 (4) | 152,280 (3) | 2.3 |
| Andhra Pradesh | 40,565 (23) | 73,009 (19) | 6.1 | Jharkhand | 47,881 (19) | 58,293 (24) | 2.0 |
| Tamil Nadu | 48,932 (18) | 85,189 (15) | 5.7 | Assam | 73,703 (10) | 79,948 (17) | 0.8 |
| Chhattisgarh | 36,573 (25) | 62,224 (21) | 5.5 | Sikkim | 76,874 (9) | 81,544 (16) | 0.6 |
| Manipur | 64,008 (15) | 103,667 (11) | 4.9 | West Bengal | 51,281 (17) | 47,900 (26) | -0.7 |
| Punjab | 135,977 (2) | 216,459 (1) | 4.8 | Bihar | 46,369 (20) | 42,986 (27) | -0.8 |
| Karnataka | 69,064 (13) | 106,248 (9) | 4.4 | Arunachal Pradesh | 148,695 (1) | 130,610 (6) | -1.3 |
| Himachal Pradesh | 69,072 (12) | 105,579 (10) | 4.3 | Mizoram | 128,506 (3) | 109,369 (8) | -1.6 |
| Gujarat | 64,033 (14) | 95,242 (12) | 4.1 | Uttarakhand | 72,638 (11) | 56,140 (25) | -2.5 |
| Kerala | 96,771 (6) | 143,769 (4) | 4.0 | All India | 53,330 | 77,283 | 3.7 |

*Note* Annual compound growth rate from 2002–03 to 2012–13. Figures in parentheses are income ranks during the year.

Animal husbandry is another significant source of income. The growth in income from animal husbandry was considerably higher in the states where the growth in farm household income was high and positive. The annual growth in income from animal husbandry was as high as 73.5% in Manipur, 41.6% in Odisha, and 22.2% in Rajasthan. The high growth in income from animal husbandry somehow compensated for the decline in income from crop production in the states where the growth in household income was lower and positive; in most of these states, the growth in income from animal husbandry was in double digits. The growth in income from animal husbandry was negative in most of the states where the growth in household income was negative.

The changes in income from wages and salaries and from non-farm business activities are not clearly related with the changes in farm household incomes, but in the states where the overall farm household income declined between 2002–03 and 2012–13 the income from wages and salaries grew at the slowest pace and the income from non-farm business activities declined sharply. The analysis of the changes in household income and its components across the various Indian states points to the fact that farming remains the mainstay of the livelihood of farming households and any strategy to enhance farm household income in future will have to focus on agriculture. While there is a need to diversify the income sources in rural India, it requires a comprehensive strategy on generating employment opportunities in the non-farm sector, which has not happened at least in the recent past.

**Table 7 Income composition and its changes across different states in India (INR/household/annum)**

| State/Income source | Crop production | | | Animal husbandry | | | Wages and salaries | | | Non-farm business activities | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | % growth | 2002–03 | 2012–13 | % growth | 2002–03 | 2012–13 | % growth | 2002–03 | 2012–13 | % growth |
| Odisha | 6,974 | 16,933 | 9.3 | 482 | 15,621 | 41.6 | 14,404 | 20,570 | 3.6 | 3,500 | 6,499 | 6.4 |
| Rajasthan | 13,848 | 37,593 | 10.5 | 1,640 | 12,147 | 22.2 | 24,416 | 30,411 | 2.2 | 5,648 | 8,512 | 4.2 |
| Madhya Pradesh | 26,627 | 48,207 | 6.1 | -6074 | 8,969 | NA | 14,976 | 15,994 | 0.7 | 2,674 | 1,570 | -5.2 |
| Haryana | 48,776 | 94,404 | 6.8 | -5012 | 31,699 | NA | 36,068 | 41,919 | 1.5 | 9,666 | 5,197 | -6.0 |
| Tripura | 16,626 | 33,281 | 7.2 | 1,502 | 3,785 | 9.7 | 15,195 | 26,233 | 5.6 | 2,431 | 1958 | -2.1 |
| Andhra Pradesh | 17,240 | 35,190 | 7.4 | 2,515 | 9,199 | 13.8 | 16,875 | 24,677 | 3.9 | 3,935 | 3,942 | 0.0 |
| Tamil Nadu | 15,316 | 23,001 | 4.2 | 2,593 | 13,715 | 18.1 | 26,325 | 34,842 | 2.8 | 4,697 | 13,630 | 11.2 |
| Chhattisgarh | 16,641 | 40,197 | 9.2 | -37 | -124 | 12.9 | 17,665 | 22,152 | 2.3 | 2,304 | 0 | NA |
| Manipur | 19,394 | 35,143 | 6.1 | 64 | 15,861 | 73.5 | 38,341 | 45,821 | 1.8 | 6,209 | 6,842 | 1.0 |
| Punjab | 75,059 | 130,308 | 5.7 | 8,431 | 19,914 | 9.0 | 40,249 | 57,362 | 3.6 | 12,238 | 8,875 | -3.2 |
| Karnataka | 31,010 | 59,286 | 6.7 | 3,729 | 7,437 | 7.1 | 29,490 | 32,087 | 0.8 | 4,834 | 7,437 | 4.4 |
| Himachal Pradesh | 16,784 | 34,524 | 7.5 | 5,180 | 12,881 | 9.5 | 33,845 | 48,355 | 3.6 | 13,262 | 9,819 | -3.0 |
| Gujarat | 26,125 | 35,240 | 3.0 | 11,398 | 23,239 | 7.4 | 23,116 | 32,097 | 3.3 | 3,394 | 4,667 | 3.2 |
| Kerala | 27,289 | 42,268 | 4.5 | 3,871 | 7,188 | 6.4 | 48,386 | 63,115 | 2.7 | 17,225 | 31,198 | 6.1 |
| Nagaland | 41,688 | 38,524 | -0.8 | -759 | 16,786 | NA | 32,405 | 64,730 | 7.2 | 11,055 | 725 | -23.8 |
| Maharashtra | 29,916 | 46,302 | 4.5 | 3834 | 6,665 | 5.7 | 21,934 | 25,862 | 1.7 | 7,165 | 10,043 | 3.4 |
| Uttar Pradesh | 22,396 | 34,221 | 4.3 | 1,521 | 6,642 | 15.9 | 13,818 | 13,819 | 0.0 | 4,521 | 4,626 | 0.2 |
| Meghalaya | 74,941 | 77,795 | 0.4 | 3,083 | 8,092 | 10.1 | 22,004 | 45,286 | 7.5 | 6,272 | 10,789 | 5.6 |
| Jammu & Kashmir | 48,790 | 36,699 | -2.8 | 8,981 | 9,441 | 0.5 | 49,154 | 88,018 | 6.0 | 14,443 | 18,121 | 2.3 |
| Jharkhand | 17,812 | 17,430 | -0.2 | 2,059 | 15,856 | 22.6 | 23,174 | 22,093 | -0.5 | 4,836 | 2,915 | -4.9 |
| Assam | 39,579 | 50,447 | 2.5 | 3,611 | 9,194 | 9.8 | 24,469 | 17,189 | -3.5 | 6,044 | 3,118 | -6.4 |
| Sikkim | 22,832 | 20,386 | -1.1 | 16,528 | 11,824 | -3.3 | 34,286 | 37,347 | 0.9 | 3,229 | 11,987 | 14.0 |
| West Bengal | 17,589 | 11,736 | -4.0 | 1,744 | 2,635 | 4.2 | 22,000 | 25,531 | 1.5 | 9,949 | 7,999 | -2.2 |
| Bihar | 21,933 | 20,633 | -0.6 | 6,816 | 3,697 | -5.9 | 12,427 | 15,819 | 2.4 | 5,193 | 2,837 | -5.9 |
| Arunachal Pradesh | 36,579 | 79,672 | 8.1 | 8,922 | 15,020 | 5.3 | 18,736 | 24,947 | 2.9 | 84,459 | 10,971 | -18.5 |
| Mizoram | 67,723 | 54,685 | -2.1 | 20,818 | 10,499 | -6.6 | 39,708 | 43,857 | 1.0 | 257 | 328 | 2.5 |
| Uttarakhand | 40,314 | 30,428 | -2.8 | 8,208 | 10,105 | 2.1 | 12,784 | 12,632 | -0.1 | 11,332 | 2,975 | -12.5 |

*Note* % growth means compound annual growth during 2002–03 and 2012–13 for a particular income source.

## Correlates of farmers' income

The income of a farm household, and its growth over time, are determined by many factors, such as farm size, resource use efficiency, access to institutional credit, technical information, and human capital. The analysis of changes in farm size did not show any effect on the extent of growth in farm household income in the states. Thus, the analysis was extended to changes in crop profits (Table 8).

At the all-India level, the crop profits increased annually at 4.2%, from INR 20,574 per ha in 2002–03 to INR 31,015 per ha in 2012–13 (at constant prices), but the growth varied considerably by state—from less than 1% per annum in Punjab to more than 10% per annum in Himachal Pradesh. Profits declined 0.1–5.6% per annum in five states—Jharkhand, West Bengal, Bihar, Arunachal Pradesh, and Mizoram. Profits grew at a much higher rate in states where the household income increased at a faster pace. The profitability of farming declined in the states where household income fell. The changes in crop profitability appear to be an important factor in enhancing farm household income. The correlation coefficient between the growth rate of profits and household income is positive and high, at 0.6.

Indebtedness is claimed to be an important indicator of farmers' distress as the incidence of debt may be a direct outcome of the lack of viability of farming. Table 9 shows the extent of debt among agricultural households, and changes in the extent, between 2002–03 and 2012–13. At the all-India level, the extent of debt of agricultural households increased at the compound annual growth rate (CAGR) of 7.1%, and it increased more in the states where the growth in household income was higher between 2002–03 and 2012–13—evident in the positive correlation coefficient (0.58) between the change in debt and change in household income for each state.

Educational attainment has the potential to improve farmers' income (Lanjouw and Lanjouw 2001; Foster and Rosenzweig 2004). Education improves human capital and positively influences farm and non-farm income. In 2002–03, almost 75% of the household heads were illiterate, an additional 20% were merely literate, and only 6% had higher education (Figure 1). The percentage of illiterates declined to less than 50% in 2012–13 and 8.6% of the farmers had higher education. The percentage of household heads with higher secondary education increased from 20% in 2002–03 to 36% in 2012–13. The percentage of household heads educated up to secondary level

**Table 8 Profits from crop farming and its growth in different states of India**

| State | Net profits (INR/ha) | | % annual growth (compounded) | State | Net profits (INR/ha) | | % annual growth (compounded) |
|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | | | 2002–03 | 2012–13 | |
| Odisha | 9,214 | 22,271 | 9.2 | Nagaland | 96,994 | 464,285 | 17.0 |
| Rajasthan | 7,402 | 18,143 | 9.4 | Maharashtra | 18,776 | 34,084 | 6.1 |
| Madhya Pradesh | 13,087 | 20,901 | 4.8 | Uttar Pradesh | 18,279 | 31,282 | 5.5 |
| Haryana | 26,112 | 35,387 | 3.1 | Meghalaya | 54,105 | 80,271 | 4.0 |
| Tripura | 31,252 | 36,646 | 1.6 | Jammu & Kashmir | 52,209 | 62,720 | 1.9 |
| Andhra Pradesh | 12,818 | 22,384 | 5.7 | Jharkhand | 30,104 | 29,832 | -0.1 |
| Tamil Nadu | 20,696 | 26,619 | 2.5 | Assam | 42,465 | 49,244 | 1.5 |
| Chhattisgarh | 12,876 | 32,871 | 9.8 | Sikkim | 21,815 | 27,515 | 2.3 |
| Manipur | 35,309 | 45,122 | 2.5 | West Bengal | 24,739 | 24,103 | -0.3 |
| Punjab | 48,936 | 52,912 | 0.8 | Bihar | 24,294 | 19,107 | -2.4 |
| Karnataka | 16,824 | 33,121 | 7.0 | Arunachal Pradesh | 316,389 | 177,591 | -5.6 |
| Himachal Pradesh | 18,709 | 51,589 | 10.7 | Mizoram | 44,197 | 39,678 | -1.1 |
| Gujarat | 15,219 | 26,258 | 5.6 | Uttarakhand | 35,825 | 39,596 | 1.0 |
| Kerala | 42,263 | 54,674 | 2.6 | All India | 20,574 | 31,015 | 4.2 |

**Table 9 Indebtedness among agricultural households in states in India (INR/household at 2012–13 prices)**

| State | Household debt | | % annual growth (compounded) | State | Household debt | | % annual growth (compounded) |
|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | | | 2002–03 | 2012–13 | |
| Odisha | 20,247 | 42,689 | 7.7 | Nagaland | 5,750 | 24,214 | 15.5 |
| Rajasthan | 48,879 | 89,630 | 6.3 | Maharashtra | 47,785 | 79,816 | 5.3 |
| Madhya Pradesh | 35,850 | 59,707 | 5.2 | Uttar Pradesh | 26,371 | 53,695 | 7.4 |
| Haryana | 70,669 | 154,868 | 8.2 | Meghalaya | 3,645 | 58,194 | 31.9 |
| Tripura | 12076 | 20,924 | 5.7 | Jammu & Kashmir | 12,029 | 36,339 | 11.7 |
| Andhra Pradesh | 32,630 | 87,915 | 10.4 | Jharkhand | 20,544 | 17,963 | -1.3 |
| Tamil Nadu | 39,503 | 106,695 | 10.4 | Assam | 8,765 | 18,581 | 7.8 |
| Chhattisgarh | 15,850 | 26,016 | 5.1 | Sikkim | 11,440 | 67,796 | 19.5 |
| Manipur | 16,889 | 24,628 | 3.8 | West Bengal | 15,099 | 26,863 | 5.9 |
| Punjab | 89,887 | 175,183 | 6.9 | Bihar | 23,123 | 34,773 | 4.2 |
| Karnataka | 50,170 | 96,685 | 6.8 | Arunachal Pradesh | 14,396 | 20,172 | 3.4 |
| Himachal Pradesh | 41,487 | 83,244 | 7.2 | Mizoram | 14,653 | 46,270 | 12.2 |
| Gujarat | 51,640 | 83,106 | 4.9 | Uttarakhand | 27,660 | 59,294 | 7.9 |
| Kerala | 60,904 | 185,827 | 11.8 | Overall | 36,672 | 73,020 | 7.1 |

**Table 10 Crop profitability across various levels of educational attainment in India**

| Education level | Profit (INR/ha) | | % annual growth (compounded) |
|---|---|---|---|
| | 2002–03 | 2012–13 | |
| Illiterate | 19,107 | 26,591 | 3.4 |
| Literate | 25,309 | 36,378 | 3.7 |
| Higher education | 23,070 | 35,829 | 4.5 |

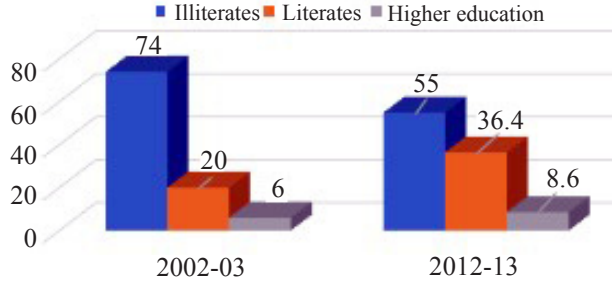


**Figure 1 Distribution of farmers according to their educational attainment (%ages)**

increased from 6% in 2002–03 to 9% in 2012–13. The literacy levels have improved over time and across all farm categories, but the percentage of household heads who had higher education is larger among larger farm households, and illiteracy is still high.

To examine the effect of education on household income, we estimate crop profits across the education levels of household heads (Table 10). If the household head is educated, a household's profits average 1.3 times that of households headed by illiterate farmers; in addition, educated farmers realize higher growth in profits. Higher education makes access to non-farm sector employment and income easier. Table 11 provides information on the education level and

**Table 11 Proportion of income from non-farm business activities across education levels**

| Education level | Income share from non-farm business activities (%) | |
|---|---|---|
| | 2002–03 | 2012–13 |
| Illiterate | 8.2 | 6.0 |
| Primary | 13.3 | 8.6 |
| Middle | 12.6 | 9.9 |
| Secondary | 13.6 | 9.0 |
| Graduate and above | 10.3 | 12.8 |

**Table 12 Use of technical information and returns and returns from farming in India**

| Information sources | Net returns (INR/ha) | |
|---|---|---|
| | 2002–03 | 2012–13 |
| Formal sources | 23,255 | 34,810 |
| Informal sources | 19,412 | 29,997 |
| No information source | 20,510 | 31,438 |

proportion of income from non-farm business activities. It appears that higher education results in a more diversified income portfolio. The non-farm sector, despite being heterogeneous, has the potential to engage workers with varying skills and education levels in a more productive manner (Birthal et al. 2014).

Access to technical information, in addition to education, can also influence farm income. In 2002–03 as well as in 2012–13 around 40% of the households had access to technical information on agriculture from formal sources (the public extension system, research institutes, Krishi Vigyan Kendras, cooperatives, radio, television) or informal sources (fellow farmers, input dealers, traders, processors). About 10–11% of farmers had access to both formal and informal sources. The profits of farmers who use technical information for decision-making are usually 12% higher than those who do not use such information (Birthal et al. 2015). The farmers who had access to formal sources of technical information in agriculture realized higher net returns than farmers that did not have such access (Table 12). The information from informal sources did not have any significant effect on income.

The variation in the proportion of households accessing technical information across states is considerable (Table 13), but the relationship between the changes in the extent of formal sources of information and income growth does not appear significant. While there is no denying the fact that technical information leads to higher income, there is a need to focus on the quality of information being made available through these sources.

Access to markets is important for realizing remunerative prices. The agricultural markets in India are dominated by informal traders through whom almost 60% of paddy and around 36% of wheat is sold (Negi et al. 2018). These traders are also an important source of credit for farmers, who commit the sale of their produce as collateral. Smallholders have greater dependence on informal traders. While farmers realize higher prices for their produce by selling to government agencies, they end up selling their produce at significantly lower prices through informal channels. The marginal farmers are even more disadvantaged and realize significantly lower prices when compared to

**Table 13 Access of agricultural households to formal sources of technical information across different Indian states**

| State | Access to formal sources (% households) | | Change in %age | State | Access to formal sources (% households) | | Change in %age |
|---|---|---|---|---|---|---|---|
| | 2002–03 | 2012–13 | | | 2002–03 | 2012–13 | |
| Odisha | 16.8 | 23.2 | 6.4 | Nagaland | 36.0 | 10.1 | -25.9 |
| Rajasthan | 7.6 | 15.2 | 7.6 | Maharashtra | 33.4 | 28.6 | -4.8 |
| Madhya Pradesh | 27.1 | 22.7 | -4.4 | Uttar Pradesh | 19.6 | 14.0 | -5.6 |
| Haryana | 25.3 | 30.3 | 5.0 | Meghalaya | 32.6 | 16.4 | -16.2 |
| Tripura | 16.4 | 30.6 | 14.2 | Jammu & Kashmir | 47.1 | 51.3 | 4.2 |
| Andhra Pradesh | 27.0 | 29.8 | 2.8 | Jharkhand | 18.7 | 23.5 | 4.8 |
| Tamil Nadu | 39.4 | 34.3 | -5.1 | Assam | 35.0 | 50.6 | 15.6 |
| Chhattisgarh | 24.1 | 32.9 | 8.8 | Sikkim | 53.1 | 20.1 | -33.0 |
| Manipur | 45.2 | 21.0 | -24.2 | West Bengal | 29.5 | 25.3 | -4.2 |
| Punjab | 22.5 | 31.0 | 8.5 | Bihar | 18.8 | 19.9 | 1.1 |
| Karnataka | 35.1 | 59.0 | 23.9 | Arunachal Pradesh | 20.8 | 14.6 | -6.2 |
| Himachal Pradesh | 32.8 | 39.3 | 6.5 | Mizoram | 20.7 | 28.8 | 8.1 |
| Gujarat | 37.6 | 30.9 | -6.7 | Uttarakhand | 8.0 | 23.8 | 15.8 |
| Kerala | 52.9 | 64.4 | 11.5 | All India | 25.9 | 26.1 | 0.2 |

large holders. Further, the average sales price in regulated markets is also lower than the minimum support price. This is in line with Meenakshi and Banerji (2005), which estimate a structural model of collusion in these markets to show price discounting.

Access to infrastructure also affects incomes. Farmers located near the roadside and urban centres engage more in the cultivation of high-value crops and the rearing of livestock because their access to markets is better and transaction costs lower (Rao et al. 2006; Birthal et al. 2005). Rural roads incentivize farmers to expand the area where high-value crops are cultivated, use improved technologies and modern inputs, and diversify out of agriculture (Shamdasani 2016). Birthal et al. (2017) examine the proportion of farm households in an income class in a district and the proportion of villages in the district having different types of infrastructure. The study reveals a negative and significant association between the incidence of low-income farmers and infrastructural variables, such as electricity, telephone lines, mobile connectivity, pucca roads, all-weather roads, commercial banks, and cooperative banks. The correlation coefficients were positive and significant for higher income classes.

Further, the income sources of farm households that had better access to infrastructure were more diversified and their profits were higher, suggesting that the link between infrastructure and farmers' income is crucial. Rural roads and communication networks are reasonably good in most states, but the complementary infrastructure in the east and north-east is poor, and that may limit the benefits of investments in roads and communication to farmers (Birthal et al. 2017). In terms of boosting agricultural growth and reducing poverty, investment in agricultural research is a high pay-off activity (Fan et al. 2014; Birthal et al. 2014), but agricultural research and education spending is low in several states, and the investments in supporting infrastructures and institutions are low in the states where agricultural research investment is comparatively high.

## Possibilities of doubling household income

We attempt to project the income of agricultural households in India and its states by 2022–23 and examine if household income might double. We use the household income estimates of the NABARD All-India Rural Financial Inclusion Survey for the year 2016–17 (at 2012–13 prices). We then project the income levels of rural households for year 2022–23.

**Table 14 Projected levels of income of agricultural households in India and gaps from target of doubling of income**

| State | Income level (INR/household/annum) | | Gap from target of doubling (%) | State | Income level (INR/household/annum) | | Gap from target of doubling (%) |
|---|---|---|---|---|---|---|---|
| | 2016–17 | 2022–23 | | | 2016–17 | 2022–23 | |
| Odisha | 68,771 | 114,702 | 16.6 | Nagaland | 88,510 | 109,434 | 38.2 |
| Rajasthan | 80,175 | 119,648 | 25.4 | Maharashtra | 91,339 | 112,279 | 38.5 |
| Madhya Pradesh | 70,443 | 105,125 | 25.4 | Uttar Pradesh | 59,315 | 72,492 | 38.9 |
| Haryana | 182,578 | 270,942 | 25.8 | Meghalaya | 89,302 | 106,011 | 40.6 |
| Tripura | 67,534 | 96,889 | 28.3 | Jammu & Kashmir | 83,217 | 95,382 | 42.7 |
| Andhra Pradesh | 66,686 | 95,133 | 28.7 | Jharkhand | 62,188 | 70,034 | 43.7 |
| Tamil Nadu | 86,953 | 121,265 | 30.3 | Assam | 87,870 | 101,307 | 42.4 |
| Chhattisgarh | 76,323 | 105,238 | 31.1 | Sikkim | 76,528 | 79,324 | 48.2 |
| Manipur | 87,718 | 116,881 | 33.4 | West Bengal | 68,993 | 119,583 | 13.3 |
| Punjab | 205,779 | 272,627 | 33.8 | Bihar | 63,825 | 115,559 | 9.5 |
| Karnataka | 94,319 | 122,124 | 35.3 | Arunachal Pradesh | 80,700 | 74,606 | 53.8 |
| Himachal Pradesh | 105,216 | 135,452 | 35.6 | Mizoram | 88,341 | 80,192 | 54.6 |
| Gujarat | 105,847 | 134,705 | 36.4 | Uttarakhand | 96,560 | 217,587 | -12.7 |
| Kerala | 150,574 | 190524 | 36.7 | All India | 86050 | 107010 | 37.8 |

*Note* All the estimates are at 2012–13 prices. The gaps are estimated w.r.t. 2016.17. Negative gap means that doubling of income can be achieved by 2022–23.

We estimate the household income CAGR for the periods 2002–03 to 2012–13 and 2012–13 to 2016–17. We consider for each state the higher growth rate of the two periods because the past debates over the feasibility of achieving the target are based on optimistic assumptions and interventions.

Table 14 presents the agricultural household income by state for 2016–17 and 2022–23 and the difference from the target (doubled income). The estimates show that the target is not likely to be achieved by 2022–23—the shortfall at the all-India level will be around 37.8%; all the states (except Uttarakhand) will likely miss the target; and that the shortfall in most states will be 25–50%.

## Conclusions and implications

This study examines the trends in farmers' income along several lines between 2002–03 and 2012–13. Farmer income grew at 3.7% per annum, but the growth was differential by state and farm class. Marginal farmers comprise the bulk of the farming population, and they are at the bottom of income distribution; their income grew at a much slower rate than of their larger counterparts. Some states (West Bengal, Bihar, Arunachal Pradesh, Mizoram, Uttarakhand, etc.) lagged behind in income levels and performed poorly over time while Odisha performed extremely well.

Livestock emerged as an important component of farmers' income, but the role of the non-farm sector was not sizable. This is a matter of concern, because the average landholding size is declining, and non-farm earnings must play a bigger role through the development of rural labour markets and the non-farm sector. The crop profitability improved, due possibly in turn to the improvement in productivity, prices, and resource use efficiency, and the improved crop profitability accelerated the pace of income growth and its variation across different states. The acceleration in the pace of income growth points to the need for targeting investment in agricultural research and development, as it seems unlikely that the target of doubling agricultural income by 2022–23 would be achieved.

The study draws the following major implications to ensure that the growth in farmers' income in India in the future is higher and more inclusive.

The more vulnerable farm households (marginal and SC) must be at the forefront of our future income growth strategy, and the disadvantaged regions (east, central, and west) should be given priority in resource allocation for higher growth.

The land resource is limited and shrinking, and there is a need to focus on improving resource use efficiency and diversifying to high-value, high-growth sectors such as horticulture and livestock. However, these sectors have not received policy focus commensurate with their economic contribution: the livestock sector's share in agricultural GDP exceeds 25%, but its share in total public sector investment and institutional credit is a mere 5% (Birthal and Negi 2012), and the insurance and extension support is negligible. To fully harness their growth potential, the horticulture and livestock sectors need more investment and institutional support. The policy should focus on allocating greater resources to high-value, high-growth sectors; developing efficient and inclusive markets and value chains; and investing in public infrastructure to stimulate private investment in marketing and food processing.

Access to technical information improves farm productivity and income, and there is a need to improve farmers' access to formal sources of agricultural extension. The use of information and communication technologies should be promoted to expand the outreach of formal sources.

Most farmers depending on informal traders fail to realize the government-administered prices for their produce, and there is a need to enforce market regulations. Improving the access of smallholders to institutional credit will reduce their dependence on informal traders.

The growth in farmers' incomes in the long run has to come from advancement in agricultural research for raising yield frontiers, improving resource use efficiency, reducing the cost of production, and improving the resilience of agriculture to climate change. It implies that the allocation of resources for agricultural research has to be raised from its current level of 0.6% of the agricultural GDP.

The rural non-farm sector is concentrated in and around large cities. But farm sizes are shrinking, and strategies are needed to develop and promote labour-intensive non-farm activities in the non-farm sector in rural areas

by investing in human capital, skills development, and industrial value chains and, thus, de-stressing agriculture from excessive employment pressure. This is most important to increase farmer income.

Finally, the inter-state disparities in household income and its sources are significant; therefore, a 'one size fits all' strategy will not improve the economic status. The regional characteristics in terms of infrastructure, investment, and institutions need to be mapped and the growth strategies formulated accordingly. If the growth in farmers' income is to be faster and more efficient, complementarities must be created among the different types of infrastructure and institutions.

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