3

Agriculture

Agriculture has been and remains a dominant sector, offering employment and subsistence to a large number of Indian households. However, the discourse surrounding agriculture and issues confronting agricultural policy have changed substantially in the six decades following Independence. While the plight of tenant farmers vis-à-vis large landlords dominated the policy landscape in the wake of independence, the difficulties facing small and marginal farmers, in an increasingly global marketplace, seem likely to dominate in the coming decades.

This chapter focuses on three major themes. First, it carries forward the theme of sectoral inequality from Chapter 2 to show relatively low levels of agricultural incomes, that is, income from family farms and animal husbandry. Second, it identifies access to productive resources—land, water, and other inputs—as being key to higher levels of agricultural incomes. Third, it focuses on inequalities in agricultural incomes across states and social groups, and highlights the unequal access to agricultural inputs across these strata.

As this chapter examines the lives of farm households, it is apparent that a vast proportion of rural households engage in agriculture in some form. However, as Chapter 2 on income documents, only about 12 per cent of the rural households rely solely on cultivation and animal husbandry for all their income. Low levels of agricultural incomes push households into other activities to sustain themselves. This chapter explores the vulnerabilities of these farm households.

Vulnerability of farm households is often linked to lack of access to land and water. Whereas land was the primary resource affecting agricultural production in the early decades of the twentieth century, access to irrigation has taken on increasing importance in recent decades. Land and water determine much of the success of Indian farms, much as they have for centuries. Large farms with good irrigation can be quite prosperous; unfortunately, they are also quite rare. Only 57 per cent of rural households own any land, and a majority of farms are less than one hectare. Three out of five Indian farms have some irrigation, but the other two depend only on the seasonal monsoons. This chapter highlights the interplay between access to land and access to water as an important resources as Indian farmers try to make ends meet in the modern era. Access to fertilizers and other inputs also play an important role in increasing agricultural productivity and also receive attention in this chapter.

Modern inputs such as pesticides, tractors, and electric water pumps now play an important role in increasing agricultural productivity, unlike in centuries past. However, these modern inputs are distributed much like land and water, and so, long standing differences have mainly been reinforced by recent changes. Traditional hierarchies, such as caste, and modern hierarchies, such as education, are both reflected in access to land and water, so agricultural incomes (like non-agricultural incomes) are more generous at the top.

Regional inequalities, a theme throughout this review, are especially marked in agriculture. Land and water again largely determine these differences. Punjab and Haryana have larger farms and plentiful irrigation, so they are the universally acknowledged heart of Indian agricultural progress. Maharashtra also has large farms but less irrigation, and West Bengal is well irrigated, but their farms are small so the typical farmer in Maharashtra and Bengal is faring

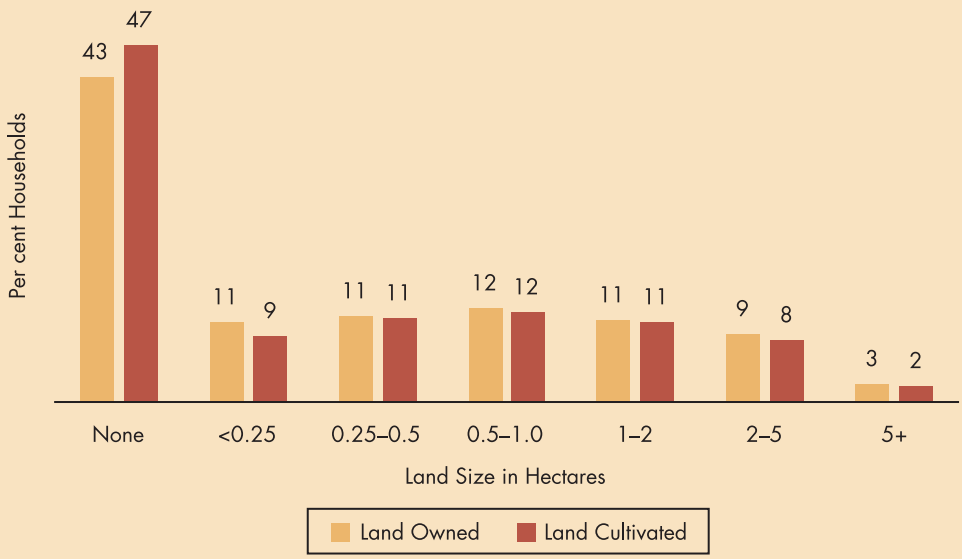

Figure 3.1 Distribution of Owned and Cultivated Land

Source: IHDS 2004–5 data.

only moderately well. In Jharkhand, farms are small, and there is little irrigation; thus, a typical Jharkhand farmer is far more likely to be poor.

Nevertheless, some of the regional differences cannot be easily explained by differences in farm size and irrigation. A one hectare farm in Punjab, with no irrigation, will typically out produce an equivalent farm anywhere else in the country. Having progressive, prosperous neighbours benefits everybody; better seeds, newer techniques, and more access to markets are some of the spillover benefits of agricultural prosperity that are available to all farmers living in Punjab.

In interpreting the data presented in this chapter, note that they rely on the IHDS and, hence, contain information proffered by the households rather than national accounts. Consequently, they reflect different dimensions of agriculture than those reported in the national accounts and are subject to considerable measurement errors. However, they also afford us an opportunity to understand the role of agriculture in shaping income inequality between different social groups and regions. Another cautionary note should be included in the data on agriculture in Tamil Nadu. Our estimates of agricultural income in Tamil Nadu appear to be exceptionally low. The fieldwork in Tamil Nadu was delayed in response to the tsunami in December 2004 and was conducted late in 2005; thus, incomes may have been affected by the tsunami.

WHO FARMS?

A majority of all Indian households (63 per cent) earn at least some of their income from agriculture. Thirty nine percent of the households cultivate some land; 43 per cent own livestock; 29 per cent have some members who engage in agricultural labour; and 7 per cent rent out agricultural property and receive some income.[1] Many households have income from more than one type of agricultural activity. The cultivating households are almost wholly rural (97 per cent), so this chapter is restricted to rural India.[2] Here, we focus solely on own-account farming and animal husbandry; agricultural wage labour is discussed in Chapter 4 on employment.

Village households are about evenly divided between those who do (53 per cent) and do not (47 per cent) cultivate any land, but this varies widely across Indian states and social groups. In Himachal Pradesh, 85 per cent of rural households cultivate land; only 25 per cent do so in Tamil Nadu (see Tables A.3.1a and A.3.1b).[3] Farming tends to increase with higher socioeconomic status, with important exceptions. Only 42 per cent of illiterate rural households farm while 64 per cent of households with a college graduate do so.

[1] These figures are based on all India data, the rest of the data in this chapter rely on cultivating households only.

[2] There is some farm ownership among urban households, especially in smaller towns. Among urban households 7 per cent own farmland but only 4 per cent cultivate this land This accounts for only 2.5 per cent of farm households, so we restrict all analyses in this chapter to rural households.

[3] It is to be noted that the distribution of households cultivating land varies according to the definition one adopts. In this section, we have considered all the households who cultivate some land, even if some of them may not own any land. Also, these figures are at variance with those reported in other large surveys, for example NSS. But in the NSS surveys too, the proportion of households cultivating any land varies over the survey rounds, for example 59th and 61st round (NSSO 2003, 2005b).

Forward castes cultivate land more often (65 per cent) than OBC households (58 per cent); rural Dalit households are the least likely (37 per cent) to cultivate (although, calculations not reported here show that 35 per cent earn agricultural wages without cultivating any land themselves). However, Adivasi households have higher than average farming rates (59 per cent). Farming has a curvilinear relationship with rural incomes: it is most common in the poorest and wealthiest quintiles, but least common in the middle quintile.

LAND AND WATER: PRECIOUS RESOURCES

One of the most striking developments of the second half of the twentieth century is a decline in average farm size and an increase in small farms. The NSS records that between 1961 and 2002–3, the proportion of farms that were classified as marginal (less than one hectare) increased from 39 per cent of all farms to nearly 70 per cent of all farms; medium and large farms (four or more hectares) decreased from about 19 per cent of all farms to 5 per cent.[4] Some of the early decline in large farms occurred with land reforms immediately following independence. But in recent years, much of the change has occurred due to land fragmentation associated with population growth. As Figure 3.1 indicates, about 43 per cent of households own no land, while about 22 per cent farm plots that are less than half a hectare.

Most farmers cultivate less than a hectare; only 20 per cent of farmers work two or more hectares. Farm size varies widely across India (see Table A.3.1b). The average landholding in Punjab is 2.65 hectares, twice the national average (1.35 hectares). Other states with large average farms include Rajasthan, Madhya Pradesh, the North-East, Gujarat, Maharashtra, and Karnataka. On the other hand, mean farm sizes in West Bengal, Himachal Pradesh, Uttarakhand, and Kerala are the smallest in the nation.

The difference between land owned and land cultivated is due to the renting in or renting out of land. Modern tenancy differs from the tenancy arrangements inherited by India at independence. Under the British rule, tenancy arrangements originated from a complex system of revenue farming in which tenancy arrangements were long term and often hereditary, and in many instances, a long line of intermediaries operated between the tenant farmer and the land title holder. Tenancy reforms following independence eliminated these arrangements and often transferred the title of the land to the tenant farmer, or provided for effective possession. In modern India, the tenancy arrangements tend to be short term, and the NSS documents that the proportion of holdings under tenancy have declined sharply from over 23 per cent in 1960–1 to about 10 per cent in 2002–3. The IHDS records a slightly higher percentage of cultivators renting in: about 15 per cent using a slightly different reference period.[5]

Rental arrangements vary across the country. In some cases, the landowner takes half the produce; in other instances, a fixed rent is paid. Households with larger farms are more likely to rent out some of the land, and those with smaller farms are more likely to rent in (see Figure 3.2a).

Cultivating households are less likely to rent out the land than those who have no adult member who can farm (see Figure 3.2b).

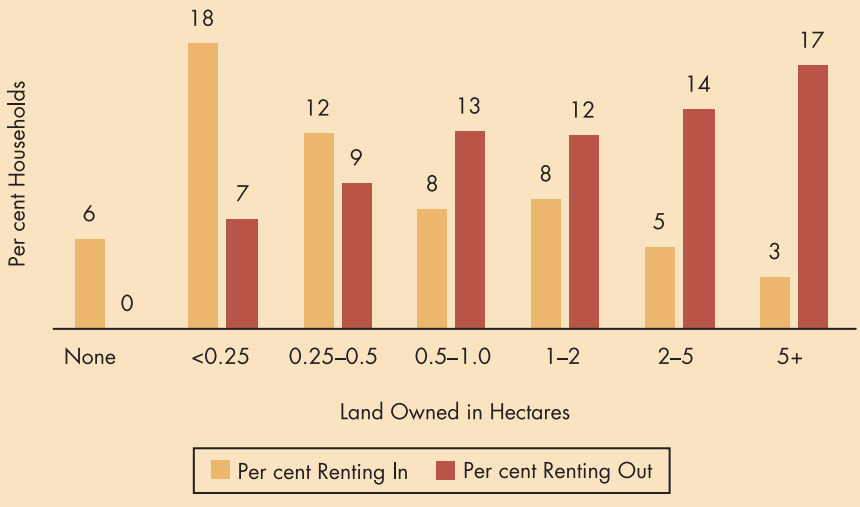

Figure 3.2a Pattern of Renting Land by Land Owned

Source: IHDS 2004–5 data.

[4] National Sample Survey Organization (2003).

[5] NSS data refer to single season, kharif or monsoon crops. The IHDS data refer to all three cropping seasons in a year and, hence, record a slightly higher incidence of tenancy (NSSO 2003).

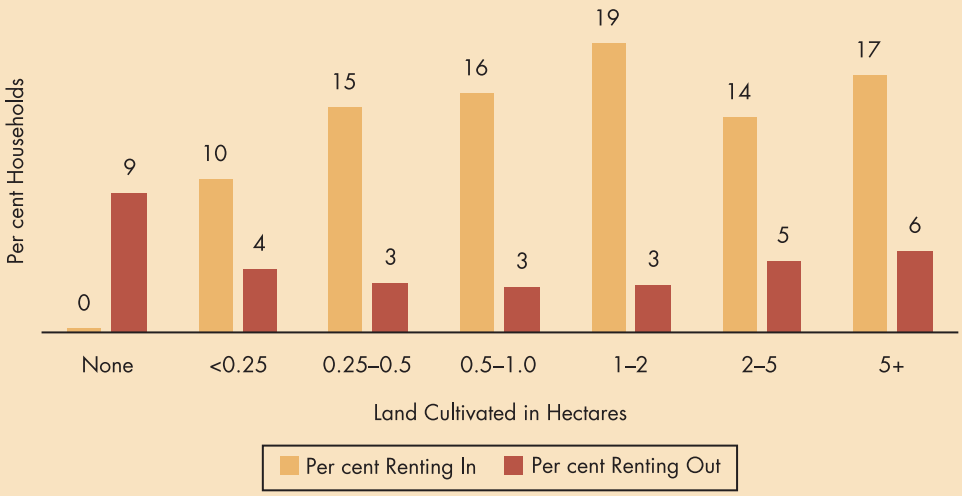

Figure 3.2b Pattern of Renting Land by Land Cultivated

Source: IHDS 2004–5 data.

Educated households are more likely to rent out land and look for other sources of income; less educated households are more likely to rent in. The renting in of land is more common in the east than elsewhere in India. More than one-fourth of cultivators in Bihar, West Bengal, and Orissa rent at least some land (see Table A.3.1b).

AGRICULTURAL INCOME

Arguably, one of the most striking features of the IHDS is the low incomes reported by agricultural households. Farmers rarely maintain accounts of expenditures on various farm inputs and, consequently, agricultural incomes remain subject to substantial measurement error. Nonetheless, most researchers involved in rural data collection came away from the interviewing process with a keen appreciation for low incomes and uncertainties faced by the farm households they studied. Fifty per cent of rural cultivating households earned Rs 8,475 or less from the crops and animals they raised (see Table A.3.1b).[6] But some households earned much more. So the average (mean) agricultural earnings were Rs 21,609. Analysis not included here shows that about 11 per cent of farms reported higher expenses than gross farm income and, thus, suffered a net loss in agriculture for the year.

Farm income depends on land and water. Large farms have large incomes. Irrigation typically doubles a farm's income mainly because irrigated farms are more often multiple cropped (80 per cent) than un-irrigated farms (34 per cent). The benefits from irrigation are even greater for large farms (see Figure 3.3).

Almost all types of farm incomes increase with land size and irrigation. Crop, crop residue, animal, and rental incomes all rise with more land and greater access to water. Expenses, also, are greater in large irrigated farms, but these are more than offset by the larger gross incomes. Yields per hectare, however, decline with farm size. Small farms—especially small, irrigated farms—are more intensively cultivated.

Because farm size and access to irrigation vary across India (Table A.3.1b), farm incomes also show enormous statewise variations. As is well known, farms in Punjab and Haryana are more prosperous than elsewhere in India. Figure 3.4 dramatizes how big this difference is.

The typical farm in Punjab or Haryana earns four to six times the national median. Farms in Jharkhand and Orissa, and more surprisingly in Andhra Pradesh and Karnataka are far less prosperous.

More advantaged groups have higher agricultural incomes. The average farm with a college graduate adult earns three times from agriculture what a farm with only illiterate adults earns (see Table A.3.1a). Similarly, forward caste farms earn more than OBC farms, which in turn earn more than Dalit farms. The ratio of forward caste farm incomes to Dalit farm incomes is about 2.75 to 1. Adivasis also do not earn much from their farms, although they earn somewhat more than the typical Dalit. Muslim farms earn about as much as OBC farms. By far the most prosperous farms belong to

[6] In some states average income of the households from cultivation and live stock appears low. This could be either due to general low productivity of land in the states, or a lower proportion of the households engaged in cultivation, or both. But, since there are a large proportion of households who have multiple sources of income, in rankings based on total household, these states could be ranked higher than the states which report higher mean income from agriculture and live stock.

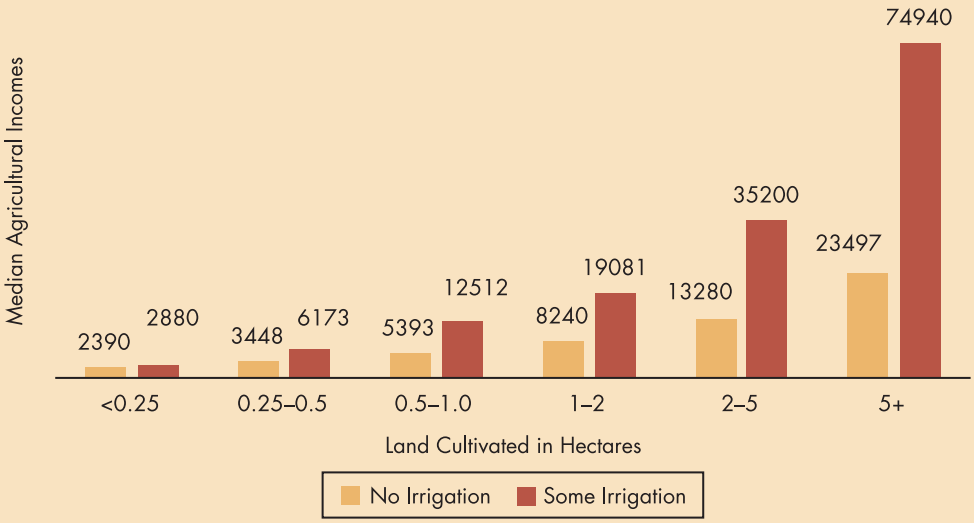

Figure 3.3 Agricultural Income by Land Ownership

Source: IHDS 2004–5 data.

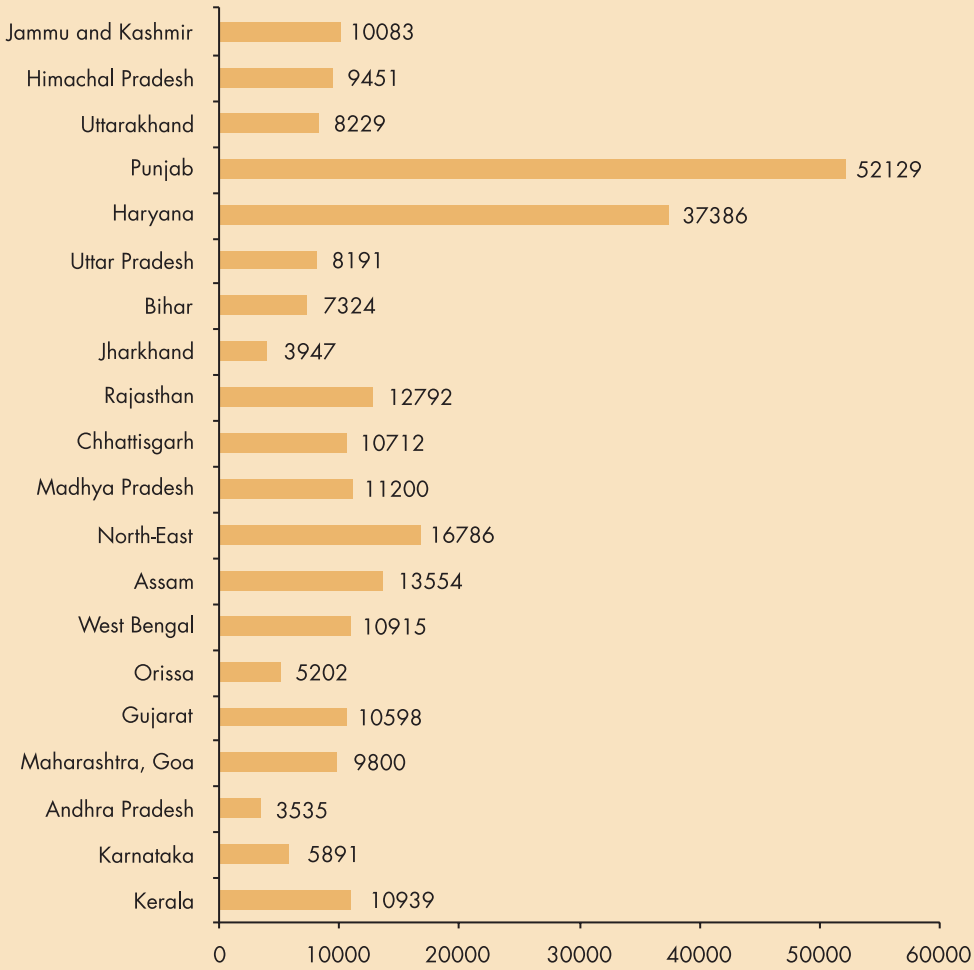

Figure 3.4 Statewise Median Agricultural Income (Cultivation + Livestock)

Source: IHDS 2004–5 data.

other religious minorities. The typical farm owned by any of the minority religious groups (Sikh, Christian, or Jain) earns twice as much as even a forward caste farm (Table A.3.1a). Here, socio-religious affiliation is often a proxy for geographic location, with Sikh farmers located in prosperous Punjab and Haryana regions, and Christian farmers located in Kerala. Adivasi farmers are often found in poorer states like Chhattisgarh. The different ways in which a variety of inequalities in access to land, irrigation, mechanization, and geographic location cascade into large inequalities in agricultural incomes between different social groups are elaborated in Box 3.1.

The IHDS also collected some information on crops grown. Analysis of this crop data shows that over half (56 per cent) of farms grew some rice, and more than two-fifths (42 per cent) grew wheat. Other cereals (for example, *jowar*, *bajra*, maize), pulses, and oilseeds were also grown by more than 20 per cent of Indian farms. Fewer farms grew high value crops such as fruits and vegetables (14 per cent), sugarcane (5 per cent), spices (4 per cent), cotton (7 per cent), and other non-food crops, such as rubber, jute, coffee, and tobacco (8 per cent). But these crops yield high returns and, thus, accounted for a substantial share of Indian farm income.[7]

While Indian agriculture as a whole is well diversified across these various types of crops, many individual crops are quite localized. Thus, spices and rubber are important in Kerala, cotton in Gujarat, and vegetables and fruits in the hills of Jammu and Kashmir and Himachal Pradesh. While wheat is still not grown much in the east and south, rice cultivation is spread across most states, leaving only dry areas in the west, such as Rajasthan, not growing significant amounts of rice.

Land and water determine not only how much Indian farms grow but often what kinds of crops are grown. Large farms more often grow cotton and oilseeds. Small and medium sized plots have relatively more non-food crops. The proportion of income from rice also diminishes for larger farms. Irrigation is even more important in determining what is grown. Sugarcane almost always requires irrigated land and wheat also does now, even more than rice which was traditionally considered the more water dependent crop. Non-food crops, especially coffee and rubber, are grown more on un-irrigated lands; to a lesser extent, so are coarse cereals (for example, jowar) and some pulses (that is, *moong* and *tur dals*).

Types of crops are also correlated with the economic and social status of the households that grow them. Food grains are grown by all farmers, but relatively more by the poor and illiterate. Wealthy, educated farm households tend to specialize in commercial crops like spices, sugar, and non-food crops. Caste and religious hierarchies follow this specialization to some extent. Cotton and sugar are dominated by forward castes. Spices and other non-food crops are dominated by minority religions. Disadvantaged groups like Dalits and Adivasis get relatively more of their incomes from food grains. The exception is the Sikhs, who owe their affluence to their success in growing rice and wheat. Once again, the geographic concentration of various socio-religious communities plays an important role. Adivasis are located in remote areas where commercial crops are not generally found and farmers from minority religions are located in areas with high productivity, such as Punjab, and in Kerala, where spices are often found.

ANIMAL HUSBANDRY

Most rural farming households (80 per cent) own animals. A quarter (24 per cent) of rural households that do not cultivate any land keep animals that produce income. Figure 3.5 shows that milch cows or buffaloes dominate animal ownership.

The importance of animals for agricultural production varies widely across India. Animal ownership is almost universal on farms in the hill states of the north. These farms earn better than average income from animals, so animal income is a significant portion of agricultural incomes. The rich states of Punjab and Haryana also have high rates of animal ownership. They earn extremely high returns on these animals, but all agriculture is productive there so the proportion of animal income is only slightly above average. Rajasthan has only slightly lower rates of animal ownership and average animal incomes, and because crop production is lower there, animal income is especially important for Rajasthan farms. In contrast to the north-west, animal production is less common in the south. Returns here are only modest, so animal husbandry is relatively unimportant for agricultural incomes. In the east, animal ownership is fairly common, but returns are very low. So animal production is also a small part of agricultural incomes.

FARM INPUTS

More Indian farms are using modern farm inputs than ever before. More than half use chemical herbicides and a quarter have irrigation pumps. Tractors are still uncommon (4 per cent of Indian farms) but in Punjab almost half (43 per cent) of the farms own their own tractor.

The spread of these modern inputs is very uneven. Large farms are far more likely to use these modern inputs than small farms (see Table A.3.1a). Moreover, farms that have

[7] We do not present detailed analysis of crop data because the interviewers were asked to write down exact crops and then code them. The coding remains subject to considerable error and results should be treated with caution.

Box 3.1 Cascading Effect of Many Inequalities in the Agricultural Sector between Social Groups

Source: IHDS 2004–5 data.

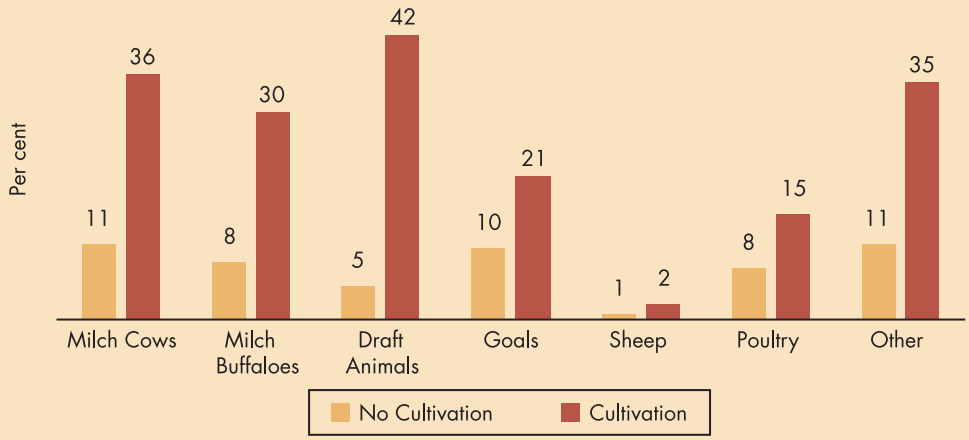

Figure 3.5 Per cent Rural Households Owning Livestock by Cultivation Status

Source: IHDS 2004–5 data.

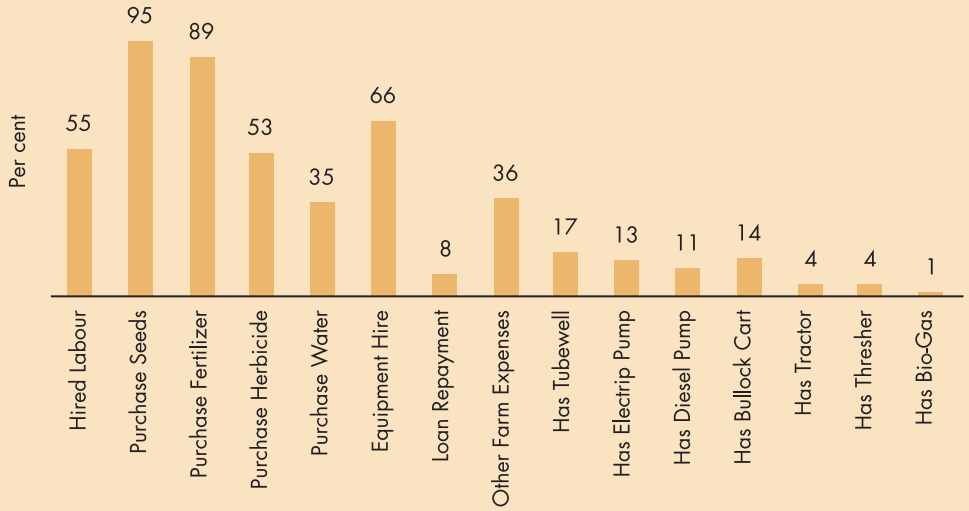

Figure 3.6 Farm Expenses and Assets for Cultivating Households

Source: IHDS 2004–5 data.

irrigation also appear to have access to other modern inputs. For example, two-thirds of irrigated farms use herbicides, compared with only 28 per cent of un-irrigated farms (tables not included). Over half (54 per cent) of farms greater than five hectares own their own diesel or electric pump while only 8 per cent of farms with less than a quarter hectare do. Consequently, the distribution of these inputs follows all the well established social and economic hierarchies. Wealthy farms with educated adults, especially forward caste farms or farms belonging to households from minority religions, are far more likely to use these modern inputs. All inputs are more common in Punjab. The typical farmer in Jharkhand is unlikely to have any of these benefits.

DISCUSSION

To sum up, with the rural population composing almost three-fourths of the population of India, agriculture remains at the core of the Indian economy, and most Indian families are not far from their farming roots. In rural areas, nearly 74 per cent households receive some income from farming or agricultural wage labour. If income from animal husbandry is included, nearly 83 per cent have some engagement with agriculture and allied activities. Thus, farming forms an integral part of the vast Indian rural panorama. It is important to emphasize this even as we discuss the diversification of incomes and activities in Chapters 2 and 4.

It is for this reason that low levels of incomes from agriculture and animal husbandry come as such a surprise. Measurement errors in agricultural incomes may play some part in this. However, after interviewing numerous agricultural families in diverse parts of India, we have developed a striking awareness of the fragility and vulnerability of these farm households. Agricultural inputs such as seeds, fertilizers, and farm implements can be expensive. Labour demand in

peak harvesting periods may outstrip available family labour and require hired labour, and water shortages may restrict multiple cropping. Most importantly, vagaries of weather may increase vulnerabilities of farmers if the crops fail.

These vulnerabilities are not evenly distributed across different segments of Indian society. Farms in Punjab are large and irrigated and, hence, are prosperous, and able to invest in new technologies. Farms in Jharkhand are small and unirrigated, and farmers in many areas grow traditional crops with traditional methods. Some states or some communities are able to find high yielding niches that offset small farm sizes or lack of water. Spices and non-food crops in Kerala are an example of this exception and so Kerala agriculture is richer than one might expect from its land and water endowments. Fruits and vegetables in Himachal Pradesh and in Jammu and Kashmir are similar exceptions. Animal husbandry is especially productive for Rajasthan. However, in spite of these pockets of high productivity, a majority of Indian farmers earn less than Rs 9,000 (US$ 200) per year—far less than they would if the labour devoted to farming were used in alternative manual work at minimum wages.

This review highlights three challenges for Indian public policy. First, it highlights the vulnerability of Indian farmers. Given their low incomes, few farmers have savings that would allow them to tide over droughts, floods, or crop failures without catastrophic consequences. Hence, a focus on insurance against catastrophes may provide a much needed safety net for farm households. Second, landownership, access to irrigation facilities, and access to farm equipment seem to differ between different socio-religious communities. Given the inequalities in non-agricultural employment (Chapter 4), education (Chapter 6) and urbanization along the same fault lines, marginalized communities, particularly Dalits and Adivasis, deserve particular attention in agricultural extension programmes and policies. Third, with low farm incomes, non-farm activities and employment are of increasing importance in the survival of farm households. The importance of non-farm activities is highlighted in our discussion on income (Chapter 2) and employment (Chapter 4). However, much of the policy discourse surrounding the growth of the non-farm sector tends to highlight the pull of the non-farm sector while ignoring the push due to low farm productivity. This subtle change in emphasis has substantial policy implications, both for the demands that might be generated for such programmes as under the National Rural Employment Guarantee Act (NREGA), and for the kind of impact a change in agricultural input or output prices may be expected to have.

HIGHLIGHTS

- About 53 per cent of rural households cultivate land. About 83 per cent of the rural households have some involvement with agriculture.
- Most farms are small; about 80 per cent cultivate two or fewer hectares.
- Farm incomes vary tremendously across India, with farmers in Punjab and Haryana far outpacing the farmers in the central plains.
- Access to land, land size, agricultural inputs, and farm incomes vary substantially between social groups.

Table A.3.1a Cultivation and Farm Condition

	Any Cultivation (per cent)	For Cultivating Households								
		Median Agricultural Income (Rs)	Mean Land Own (ha)	Rent in Land (per cent)	Rent out Land (per cent)	Any Irrigation (per cent)	Hired Labour (per cent)	Use Herbicide (per cent)	Diesel or Elec. Pump (per cent)	Has Tractor (per cent)
All India	53	8,475	1.345	15	4	60	55	53	23	4
Land Owned (Hectares)										
None	6	5,868	0	100	0	73	51	46	5	1
<0.25	85	3,471	0.148	21	1	65	39	46	8	0
0.25–0.5	90	4,857	0.374	14	2	58	46	49	15	1
0.5–1.0	86	8,721	0.73	9	4	58	58	53	20	2
1–2	90	12,340	1.346	9	5	56	63	57	29	5
2–5	90	23,660	2.893	6	6	59	68	63	40	12
5+	93	42,300	9.159	4	11	68	73	64	54	29
Education										
None	42	5,182	0.93	21	3	55	45	44	14	1
1–4 Std	52	5,851	1.013	19	3	55	51	54	16	1
5–9 Std	56	8,580	1.262	16	3	60	51	52	21	3
10–11 Std	56	13,550	1.7	12	3	65	64	62	32	9
12 Std/Some college	64	12,027	1.813	9	6	64	65	59	32	9
Graduate/Diploma	64	17,197	2.048	7	7	68	76	65	35	12
Place of Residence										
Developed village	44	8,921	1.475	13	4	61	60	55	28	6
Less developed village	60	8,243	1.256	17	4	60	52	52	19	4
Household Income										
Income < 1000 Rs	75	–2,346	1.391	29	1	65	70	54	25	3
Lowest Quintile	53	3,448	0.792	18	3	53	49	46	13	1
2nd Quintile	47	7,100	0.903	18	3	54	47	45	14	1
3rd Quintile	50	13,368	1.175	15	4	62	52	55	21	2
4th Quintile	53	23,073	1.588	12	4	65	59	59	30	6
Highest Quintile	63	48,270	2.885	8	6	71	74	69	44	17
Social Groups										
Forward Caste Hindu	65	14,210	1.981	8	6	65	65	59	34	8
OBC	58	8,571	1.37	17	4	63	57	53	23	5
Dalit	37	5,166	0.771	23	3	61	43	48	14	1
Adivasi	59	6,203	1.404	11	3	28	43	39	11	1
Muslim	47	9,101	0.783	16	4	74	58	67	16	3
Other religion	50	28,850	1.386	7	2	60	76	69	63	17

Note: Elec. refers to electric.

Source: IHDS 2004–5 data.

Table A.3.1b Statewise Cultivation and Farm Ownership

	Any Cultivation (per cent)	For Cultivating Households								
		Median Agricultural Income (Rs)	Mean Land Own (ha)	Rent in Land (per cent)	Rent out Land (per cent)	Any Irrigation (per cent)	Hired Labour (per cent)	Use Herbicide (per cent)	Diesel or Elec. Pump (per cent)	Has Tractor (per cent)
All India	53	8,475	1.345	15	4	60	55	53	23	4
Jammu and Kashmir	83	10,083	0.553	0	2	65	49	61	5	2
Himachal Pradesh	85	9,451	0.587	2	1	18	9	23	0	1
Uttarakhand	71	8,229	0.485	5	2	45	14	28	7	6
Punjab	29	52,129	2.654	14	4	99	78	97	83	43
Haryana	38	37,386	1.67	19	7	78	39	79	29	21
Uttar Pradesh	66	8,191	0.925	20	6	94	48	56	24	7
Bihar	56	7,324	0.715	36	4	94	62	47	14	4
Jharkhand	50	3,947	0.966	7	2	15	39	23	9	1
Rajasthan	67	12,792	2.326	8	1	50	37	31	28	5
Chhattisgarh	75	10,712	1.347	11	3	37	62	43	11	1
Madhya Pradesh	60	11,200	2.172	12	3	64	44	39	37	6
North-East	43	16,786	3.373	16	21	45	69	64	4	4
Assam	46	13,554	0.768	14	3	54	31	89	3	0
West Bengal	43	10,915	0.554	28	5	79	81	91	18	2
Orissa	65	5,202	0.862	27	5	35	74	54	6	2
Gujarat	52	10,598	2.251	6	2	48	47	67	13	7
Maharashtra, Goa	64	9,800	2.182	7	2	45	41	49	41	3
Andhra Pradesh	29	3,535	1.29	16	3	47	81	72	24	2
Karnataka	55	5,891	1.9	9	4	26	82	44	18	2
Kerala	38	10,939	0.579	2	1	41	69	53	49	0
Tamil Nadu	25	NA	1.277	10	2	64	91	52	42	2

Note: NA—not available due to possible measurement errors and/or small sample sizes.

Source: IHDS 2004–5 data.