Policy Paper 39

Changes in Indian Agriculture
Household-level Evidence

Raka Saxena
Shivendra K Srivastava
Balaji S J
Abimanyu Jhajhria
Md Arshad Khan

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ICAR – National Institute of Agricultural Economics and Policy Research
New Delhi - 110 012

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Preface

A pre-requisite of inclusive economic growth is the faster growth in agriculture as it is a major source of livelihood for about 45% of the population. The current regime envisages meeting multiple goals of enhancing farmers' income, improving resource-use efficiency and sustainability through effective institutional and policy support to adoption of improved technologies and agronomic practices.

This policy paper examines the recent changes in Indian agriculture from several angles, including agrarian structure, cropping choices, investment patterns, and farmers' income. Information is essential for enhancing productivity. The paper also discusses information needs of farmers, procurement of inputs, and disposal patterns of agricultural produce. I hope the evidence presented in this paper will help stakeholders to understand the transformation in agriculture, and accordingly provide feedback for reforming and redesigning of policies and programmes to meet the emerging challenges in agriculture.

Pratap Singh Birthal
Director, ICAR-NIAP

Acknowledgments

This paper examines three sequels of Situation Assessment Surveys of Agricultural Households in India to examine various facets of Indian agriculture. Despite a gradual shift towards off-farm and non-farm activities, agriculture continues to be the primary source of income for the majority of rural households. Crop farming is the primary source of income for the majority of agricultural households. Animal and fish farming is emerging as high-growth sectors. Diversification within and outside agriculture is an important agenda for improving farmers' income and reducing inter-regional inequality in income distribution. Regional variations in credit access and investment warrant an objective agricultural credit policy along with a greater priority for poor states. Emerging digital platforms and newer sources of information need to be successfully steered for greater benefits. Institutional participation can drive the adoption of innovative farm practices. The participation of farmers in institutional activities, however, is limited. It's important to promote non-farm activities, particularly for smallholders.

We are grateful to Dr Suresh Pal, former Director, ICAR-NIAP, who motivated the team to bring out this study. The team has been enriched by his expertise and guidance to carry out this work. A National Workshop was also organized at ICAR-NIAP to discuss the findings. The team greatly benefitted from the suggestions and feedback. We are grateful to Dr P. S. Birthal, Director, ICAR-NIAP for his valuable guidance and painstaking efforts in improving the manuscript and sharpening the interpretations. We also acknowledge the insightful comments from the referees on the manuscript. Last but not the least, we want to express our gratitude to everyone who helped us in bringing out this policy paper.

Authors

Executive Summary

The study compares various parameters related to farming and farm households utilizing data from three surveys on the Situation Assessment of Agricultural Households conducted in 2002-03, 2012-13, and 2018-19. Currently, 9.3 crore rural households in India are engaged in agriculture and allied activities. Two-thirds of the population and 70% of the workforce in India reside in rural areas. The key findings are summarized below:

1. ***There is a heavy reliance on agriculture*:** Although the rural economy is gradually diversifying towards off-farm and non-farm activities, the majority of rural families (58.3%) still rely heavily on agriculture for their livelihood. On the other hand, the average size of landholding has declined from 1.06 hectares in 2002-03 to 0.83 hectares in 2018-19. Close to 69% of the total operational holdings are less than one hectare (termed marginal holdings), with an average size of 0.495 hectares, occupying 31% of the land. Significant variations prevail in the operated area across states. The average size of landholding varies from 0.36 hectares in West Bengal to 1.58 hectares in Rajasthan. Farmers lease in land to improve the scale of production. The percentage of operational landholdings with leased-in land has increased from 9.9 in 2002-03 to 17.3 in 2018-19.

2. ***Crop farming is the main source of household income but there is ample scope to diversify income sources***: Crop farming is the primary source of income for the majority of agricultural households (68.9%), but with a significant inter-state variation. Income from crop production is negatively associated with landholding size. This compels smallholders to diversify their income portfolio towards non-agricultural activities. There exists ample scope to promote non-farm economic activities. Similarly, there exists scope for diversification towards animal farming. A significant portion of agricultural households earns a major portion of their income from wage earnings. Diversification within and outside agriculture is an important agenda for improving farmers' income and reducing inter-regional inequality in income distribution.

3. ***There has been a sluggish growth in farmers' income***: Household income between 2012-13 and 2018-19 grew at an annual growth

of 1.5%. The share of income from crops has declined. Much of the increase in income came from wages and animal farming. In 2018–19, wages contributed 40% to the households' income followed by income from crops (37%). Jharkhand and Odisha were the lowest-income states in 2018-19. Other states which have considerably low income are Bihar, Chhattisgarh, Telangana, Uttar Pradesh, and West Bengal. To the dismay, the income from crop cultivation has witnessed negative growth of 2.72% between 2012-13 and 2018-19. This indicates the declining role of crop husbandry as a livelihood option. The wage income witnessed a surge, turning out to be the most important income. Unfortunately, the majority of the states have only modest or even negative growth in crop income. This a matter of serious concern. Only four major agricultural states—West Bengal (1.1%), Gujarat (1.4%), Bihar (1.9%), and Uttarakhand (9.0%)—witnessed positive growth of more than one percent in crop income.

4. ***Income from farming of animals has risen continuously***: Animal and fish farming are emerging as high-growth sectors. Livestock has a high-income share in Punjab and Haryana, while Chhattisgarh, West Bengal, and Odisha have low incomes from livestock. In contrast, farm households in Chhattisgarh, Kerala, West Bengal, Telangana, and Odisha earn less than 10% of their incomes from livestock.

5. ***Irrigation is key to enhancing productivity and reducing production risk***: Irrigation enhances agricultural productivity and ensures stability in agricultural output, especially during unfavorable weather and climatic conditions. This makes irrigation an adaptation measure against changing climate. Although farmers' access to irrigation has improved significantly, still about half of the cultivated area remains unirrigated. Irrigation coverage varies across crops and regions. Investment in irrigation infrastructure and developing optimum crop plans based on the availability of water and other natural resources are priority areas for the sustainable development of agriculture.

6. ***Farm investment is low***: Large farmers (>10 hectares) invest more than 25 times of those cultivating less than 0.4 hectares. Smallholders invest more in livestock and poultry. On the other hand, more than 70% of the investment on large farms is in farm machinery and implements. However, there is significant variation in farm investment across states. A consistent decline in investment in livestock and poultry is observed across landholding classes, the investment proportion varying from 43% among households with 0.4 hectares of land to around 11% in among large farmers. Similar is the case in non-farm investments. Marginal and small farmers, respectively, invest 6% and 12% in non-

farm activities, but large farmers barely invest in non-farm activities. The credit institutions must extend short-term and medium-term credit for investment in animal husbandry, and long-term credit to other farmers for the mechanization of agriculture. Regional variations in credit access and investment warrant an objective agricultural credit policy along with a greater priority for poor states.

7. ***Farmers still rely heavily on the local markets and mandis for the sale of agricultural output***: Similarly, the local market is the predominant channel for the procurement of inputs. Private processors are emerging as an export-oriented marketing channel for agricultural produce. Wheat and paddy are the main crops sold to the procurement agencies at MSP. Effective implementation of market reforms and price support is needed to enhance farmers' income.

8. ***Information is critical in enhancing productivity and income***: Progressive farmers, input dealers, and electronic & print media remain the primary sources of technical advice and information. Newer information sources and digital platforms are emerging, which need to be effectively channelized for larger gains. Institutional participation can drive the adoption of innovative farm practices. The participation of farmers in institutional activities, however, is limited. Studies have indicated several benefits for agricultural households of their association with registered organizations, which embrace information on technologies, inputs, and markets. Efforts are required to increase membership in such organizations to develop the capacity of agricultural households.

9. ***Indebtedness has increased****:* There has been a rise in farm households' indebtedness. The share of indebted households is higher for large farmers. Their outstanding loan amount is approximately eight times that of small farmers. Further, the outstanding loan amount for large farmers has grown much faster than for other farm categories. Haryana, Telangana, Kerala, Punjab, and Andhra Pradesh are the major states which have higher investment levels. In contrast, Jharkhand, Assam, Tripura, Sikkim, and Nagaland invest the least.

10. ***Financial inclusion and mainstreaming of farmers remain the priority agenda*****:** Close to 98% of agricultural households have a bank account. The coverage under PMFBY is particularly dismal for marginal farmers, with less than 6% insuring the crop. The adoption of crop insurance is positively associated with farm size. The adoption of the Soil Health Card Scheme and Animal Health Card Scheme also increases with the size of the land holding.

There is a need for a supportive policy environment to enhance agricultural income and nutrition security. Non-farm activities need to be encouraged, especially for smallholders. Rural areas have the ability to industrialize as well, but it's crucial to prioritize labor-intensive agro-based industries. Moreover, to relieve the excessive employment pressure on agriculture, a booming rural non-farm economy is essential. Agri-infrastructure and MSME financing will go a long way toward promoting linkages between the agricultural and rural non-agricultural sectors.

♦♦♦

1 Agrarian Structure

A majority (58.3%) of the rural families in India rely on agriculture for their livelihood. However, the landholding size has decreased over time. The average operated land for agricultural purposes has decreased from 1.06 hectares in 2002–03 to 0.83 hectares in 2018–19. The increasing marginalization of landholdings prompted smallholders to diversify towards non-crop and non-agricultural activities.

1.1 Land Utilization Pattern

Two-thirds of the population and 70% of the workforce in India resides in rural areas. Over 17 crore families dwell in rural regions, as per the recent survey on Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India (SAS-LLH) (2018-19). Although the rural economy is gradually diversifying away from agriculture, the majority of the rural families (58.3%) still rely heavily on agriculture for their livelihood (Table 1). Thus, agriculture is a crucial sector for the overall development of rural economy.

Table 1. Distribution of sample households across the major occupation classes, 2018-19 (%)

Household type	Agricultural households	Non-agricultural households	All Rural households
Self-employed in agriculture			
Crop production	68.9	6.1	40.0
Animal rearing	2.3	0.6	1.5
Other agricultural activities	0.6	1.1	0.8
Regular wages in agriculture	1.2	2.7	1.9
Casual labor in agriculture	5.9	23.8	14.1
Agriculture: total	78.9	34.3	58.3
Non-agriculture: Total	21.1	65.7	41.7
Total households (%)	100	100	100
Total estimated households (crore)	9.31	7.94	17.25

Source: SAS-LLH Survey (2018-19)

Over 9.31 crore rural households in India are engaged in agriculture and allied activities. The SAS-LLH considered a household as an 'agricultural household' if it earns more than Rs. 4000 from agriculture and allied activities during the last 365 days, and at least one member was self-employed in agriculture either in the principal or in subsidiary status. Some of the members of agricultural households were also engaged in non-agricultural activities, hence their household income (from non-agricultural activities) exceeds the income from agriculture. In other words, a household identified as an agricultural household in the SAS-LLH can derive a major portion of its annual income from non-agricultural activities and thus can be qualified as a non-agricultural household based on alternate criteria of a major source of income. Only 21.1% of the agricultural households derive a major portion of annual income from non-agricultural activities in 2018-19. Therefore, non-agricultural activities are an important source of income for agricultural households. At the same time, 34.3% of the non-agricultural households derive a major portion of their income from agricultural activities. However, most agricultural households (68.9%) derive a major portion of their income from crop production.

1.2 Distribution of Landholdings

India is predominantly a country of smallholders. For agricultural households, land is the most important asset, and household income is directly correlated with the size of landholding. According to the SAS-LLH Survey (2018-19), 69% of the total operational holdings are of size less than one hectare, with an average size of 0.495 hectares. These are termed as marginal farmers. Furthermore, there is a significant inequality in farmers' access to land. Marginal farmers who comprise 69% of the total farmers owned 31% of the land (Table 2). To improve scale economies, farmers lease in land, and therefore, the operated area is marginally higher than the owned land. In 2018-19, India's average area per operational holding was 0.921 hectares compared to the owned area of 0.876 hectares. The average operated area across farm-size groups ranged from 0.534 hectares for marginal farmers to 14.255 hectares for large farmers. The trends in the distribution of number and area of operational holdings of rural households in India are presented in Appendix 2.

Further, there are significant differences in the operated area across states. The area per operational holding varied from 0.36 hectares in West Bengal to 1.58 hectares in Rajasthan (Figure 1). It should be mentioned that West Bengal started the land reforms fairly early by putting a cap on owned land and redistributing surplus land to landless peasants. Close to 94% of West Bengal's operational holdings or 76.3% of the overall operated area,

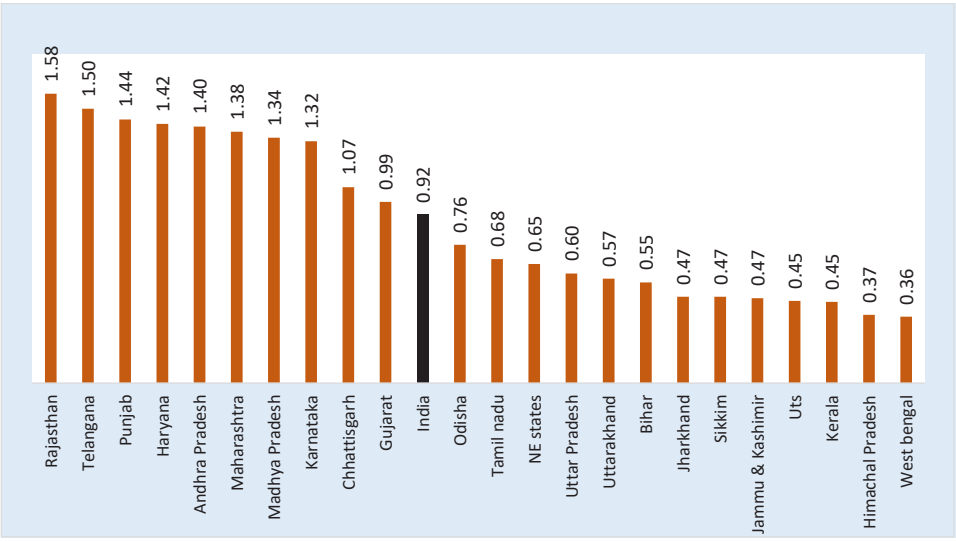
fall in the marginal farm category (Table 3 and 4). Surprisingly, there is no holding of more than 10 hectares in the state. Likewise, there is a significant inter-state variation in operational land holdings in all the states.

Table 2. Owned and operational land of agricultural households by farm-size category, 2018-19

Farm size category	Distri-bution of op-erational holdings (%)	Distribu-tion of op-erational area (%)	Owned area per opera-tion-al holding (ha)	Operated area per opera-tion-al holding (ha)	No. of par-cels per hold-ing	Op-erational area per parcel (ha)
Landless* (<0.002 ha)	-	-	0.000	0.000	-	-
Marginal (>=0.002 to 1 ha)	69	31	0.495	0.534	3	0.2
Small (1-2 ha)	18	25	1.212	1.258	3	0.4
Semi-medium (2-4 ha)	9	23	2.287	2.388	3	0.7
Medium (4-10 ha)	3	16	5.051	5.425	4	1.5
Large (>10 ha)	0	5	10.776	14.255	5	2.6
Overall	100	100	0.876	0.921	3	0.3

Source: SAS-LLH Survey (2018-19)
*Note: * Land leased-in by landless households was negligible*

Figure 1. State-wise average operated area per holding for agriculture in 2018-19 (ha)



Telangana has the highest proportion of agricultural households earning most of their income from crop production. The state has the lowest proportion of operational holding in the marginal farm category.

The estimated correlation coefficient reveals a strong negative association (-0.51) between the share of marginal landholdings and income from crop production.

The average size of landholding in India has decreased from 1.06 hectares in 2002-03 to 0.83 hectares in 2018-19. (Appendix 1). As a result, the percentage of operating holdings falling in the marginal-size category increased from 70% in 2002–03 to 72.6% in 2018–19. However, the share of marginal landholdings in the total operated area increased from 22% in 2002-2003 to 31.7% in 2018–19. Income from crop production is negatively associated with the marginalization of landholdings. This prompts smallholders to diversify their income portfolio towards non-agricultural activities.

Further, the average number of parcels per holding has increased in the past two decades (Appendix 1). Land parcels are spread apart, making it challenging for farmers to manage the shared agricultural activities. The average size of the parcel is 0.3 hectares (Table 2). The number of parcels, however, increase across successive land sizes. However, the size of the parcel remains small, ranging from 0.2 hectares for marginal farmers to 2.6 hectares for large farmers.

Farmers lease in land to improve scale economies. The percentage of operational landholdings with leased-in land has increased from 9.9 in 2002-03 to 17.3 in 2018-19 (Appendix 1). In terms of area, the proportion of leased-in land in the total operational area increased from 6.5% in 2002-03 to 13.0% in 2018-19. It may be noted that tenancy is largely an informal agreement between landlord and tenant. This discourages tenants from investing in land improvement. Landlords are hesitant to sign a formal lease agreement with the tenants because of the fear of losing land rights. A legal basis for a formal lease is provided in the recently enacted Model Agriculture and Land Leasing Act 2016. Currently, laws governing land leasing vary across states. For instance, leasing is prohibited in Telangana, Bihar, Madhya Pradesh, and Karnataka, the exception being widows, individuals with disabilities, and members of the armed forces. Kerala prohibits land leasing, but permits self-help groups (SHGs) to lease in or out land. The states with land leasing laws are West Bengal, Rajasthan, Andhra Pradesh, and Tamil Nadu. To accelerate investment in land improvement and consequently agricultural productivity, the Union Government is urging states to implement the Model Agriculture and Land Leasing Act (2016).

Table 3. Distribution of operational area across the size of operational holdings (%)

State	Marginal (>=0.002 to 1 ha)	Small (1-2 ha)	Semi-medium (2-4 ha)	Medium (4-10 ha)	Large (>10 ha)	Overall
West Bengal	93.8	5.0	1.0	0.1	0.0	100
UTs	88.4	7.5	3.0	0.9	0.1	100
Kerala	87.3	9.3	2.8	0.5	0.1	100
Jammu & Kashmir	86.4	11.6	1.9	0.1	0.0	100
Bihar	85.8	10.9	2.9	0.2	0.1	100
Himachal Pradesh	85.8	10.4	3.4	0.4	0.0	100
Uttar Pradesh	82.8	11.8	4.3	1.0	0.1	100
Jharkhand	82.6	13.5	3.7	0.2	0.0	100
Uttarakhand	82.1	9.8	6.1	2.0	0.0	100
Odisha	75.2	19.0	5.1	0.9	0.0	100
Tamil Nadu	74.3	17.0	6.1	2.2	0.3	100
Gujarat	68.2	17.4	10.2	3.5	0.1	100
NE States	65.8	25.6	7.9	0.7	0.1	100
Punjab	60.4	14.7	13.6	9.4	1.7	100
Haryana	58.3	19.2	15.1	5.4	2.0	100
Chhattisgarh	56.4	29.1	12.3	1.9	0.4	100
Andhra Pradesh	52.8	23.5	18.7	3.5	1.6	100
Rajasthan	51.3	23.1	15.4	9.2	1.1	100
Madhya Pradesh	50.7	29.1	13.8	5.9	0.6	100
Karnataka	50.3	26.7	17.2	5.2	0.7	100
Maharashtra	48.6	28.9	16.3	5.4	0.7	100
Telangana	42.5	30.8	20.1	6.2	0.4	100
All-India	69.3	18.3	8.9	3.0	0.3	100

Source: SAS-LLH Survey (2018-19)

Table 4. Distribution of area of the operational holdings across the size of operational holdings (%)

State	Marginal (>=0.002 to 1 ha)	Small (1-2 ha)	Semi-medium (2-4 ha)	Medium (4-10 ha)	Large (>10 ha)	Overall
West Bengal	76.3	15.9	6.1	1.8	0.0	100
Jammu & Kashmir	64.5	26.9	7.5	0.8	0.0	100
Bihar	59.3	24.5	12.2	1.5	2.6	100
Jharkhand	57.5	27.3	13.3	1.7	0.2	100
UTs	56.3	18.8	12.5	8.3	2.1	100
Kerala	55.0	24.8	13.4	4.5	2.3	100
Himachal Pradesh	54.3	25.3	15.5	5.2	0.0	100
Odisha	49.3	30.6	14.9	4.7	0.5	100
Uttar Pradesh	48.0	24.6	17.2	8.6	1.5	100
Uttarakhand	40.5	20.6	22.8	15.0	1.3	100
NE States	36.9	39.0	19.5	3.7	0.8	100
Tamil Nadu	36.7	28.2	17.4	12.4	5.4	100
Chhattisgarh	28.9	33.8	24.5	9.0	3.7	100
Gujarat	28.6	23.5	25.7	20.7	1.4	100
Madhya Pradesh	20.2	27.8	24.7	21.8	5.5	100
Jharkhand	19.5	26.0	29.6	18.8	6.0	100
Maharashtra	18.4	26.7	27.6	19.9	7.5	100
Andhra Pradesh	17.6	21.6	32.1	13.5	15.3	100
Rajasthan	16.8	19.4	23.6	31.9	8.2	100
Telangana	14.5	27.2	33.8	21.2	3.3	100
Haryana	13.8	18.2	27.1	22.1	18.7	100
Punjab	12.4	13.3	25.0	35.4	13.9	100
All-India	30.7	25.0	22.6	16.4	5.4	100

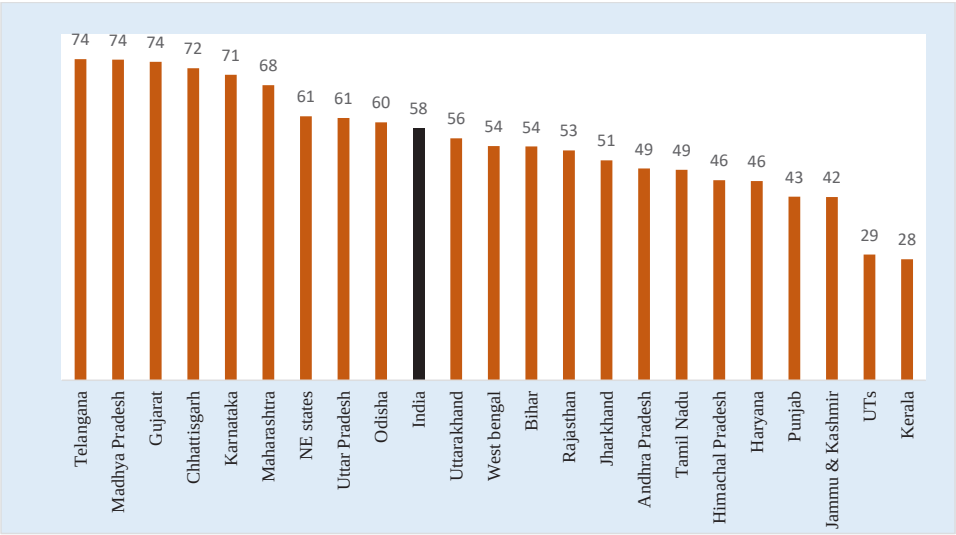
Source: SAS-LLH Survey (2018-19)

1.3 Principal Activities for Agricultural Households

There exists a wide inter-state variation in engagement of rural households in agricultural activities (Figure 2). The proportion of rural

households deriving a major portion of the income from agricultural activities varies from 28% in Kerala to around 74% in Telangana, Madhya Pradesh, and Gujarat in 2018-19. The difference in occupational structure across states, therefore, is a major source of variation in the income of agricultural households.

Figure 2. Share (%) of rural households engaged in agricultural activities, 2018-19



Source: SAS-LLH Survey (2018-19)

The occupational structure of agricultural households across states in 2018–19 is shown in Table 5. Although crop farming is the primary source of income for the majority of agricultural households (68.9%) nationwide, there is a significant inter-state variation in the occupational structure. Among the states, the share of agricultural households engaged in crop cultivation (as a major source of income) varies from 34.4% in Kerala to 87.6% in Telangana. It's interesting to note that only 5% of agricultural households in Telangana rely on income from non-farm sources. Non-farm income dominates in some states; for instance, non-farm income comprises 44% of the total income in Kerala. There exists ample scope to promote non-farm economic activities. Similarly, there exists scope for diversification towards animal farming as a full-time enterprise. A significant portion of agricultural households earns a major portion of their income as casual labor (in agriculture and non-agricultural activities). This implies that inadequacy of agricultural activities to provide sufficient earnings, compels farmers to work as labor to supplement their income. Thus, diversification within and outside agriculture is an important agenda for improving farmers' income and reducing inter-regional inequality in income distribution.

Table 5. State-wise distribution of agricultural households across the major occupation classes, 2018-19 (%)

State	Self-employed				Regular wages/ salaries		Casual labor		Oth-ers	All
	Crop cultiva-tion	Ani-mal rear-ing	Other agri-cul-tural activi-ties	Non-ag	Agri-cul-ture	Non-agricul-ture	Ag-ri-cul-ture	Non-ag-ricul-ture		
Telangana	87.6	0.7	0.4	2.7	0.9	1.5	5.0	0.8	0.5	100
Karnataka	79.3	1.2	0.3	2.0	1.7	4.9	6.8	3.1	0.8	100
Madhya Pradesh	76.9	1.3	0.4	3.1	0.7	3.0	9.2	4.5	0.8	100
Bihar	75.5	1.9	0.4	3.8	1.4	3.3	5.2	7.6	1.0	100
Chhattisgarh	75.1	0.1	0.6	2.0	0.2	7.5	7.9	6.0	0.6	100
Gujarat	74.6	4.6	0.3	1.6	1.8	5.7	7.0	4.1	0.4	100
Odisha	73.5	1.3	0.0	3.4	0.5	5.1	4.6	10.3	1.3	100
NE states	73.3	1.5	4.0	4.0	1.5	9.0	1.4	4.0	1.3	100
Maharashtra	73.0	1.9	0.9	3.2	0.8	6.6	9.8	2.4	1.4	100
Uttar Pradesh	70.8	1.6	0.2	5.5	0.9	4.8	3.8	10.2	2.1	100
Uttarakhand	70.0	1.4	0.2	5.0	1.2	10.9	0.6	8.4	2.3	100
Jharkhand	67.7	0.1	0.5	2.4	1.2	4.8	0.5	20.3	2.4	100
West Bengal	62.3	0.7	1.6	9.0	1.8	6.5	11.0	5.8	1.3	100
Andhra Pradesh	60.8	9.3	0.2	5.2	1.0	7.4	11.2	4.0	0.8	100
Rajasthan	60.1	2.7	0.5	5.6	1.3	8.2	1.7	17.8	2.1	100
Haryana	57.8	4.2	0.1	7.0	1.2	18.3	3.5	5.3	2.6	100
Himachal Pradesh	57.6	1.2	1.2	9.5	1.5	16.9	0.8	9.9	1.5	100
Tamil Nadu	55.7	12.3	1.6	3.2	2.0	9.2	8.0	6.7	1.4	100
Punjab	55.4	3.3	0.6	5.9	1.5	9.9	9.9	9.6	4.1	100
Jammu & Kashmir	40.1	1.9	0.9	10.0	3.3	20.5	0.5	19.6	3.2	100
Kerala	34.4	4.3	1.6	14.2	2.1	13.6	5.0	16.3	8.5	100
UTs	30.0	6.1	1.9	12.8	0.3	25.8	1.3	20.7	1.0	100
India	68.9	2.3	0.6	4.8	1.2	6.5	5.9	8.3	1.6	100

Source: SAS-LLH Survey (2018-19)

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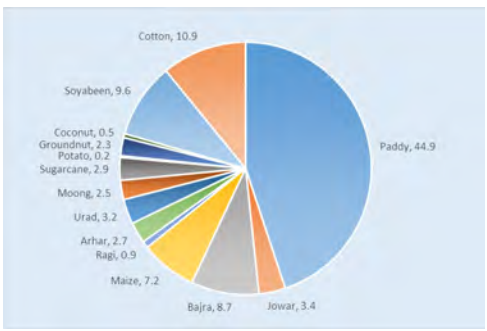
2 Cropping Pattern

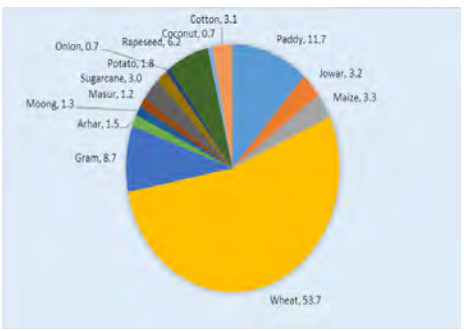
India's cropping pattern is dominated by paddy and wheat. Farmers' crop choices are influenced by several factors such as crop revenue, access to irrigation and credit, climate suitability and food habits at regional level. The survey revealed a significant positive association between the irrigation and crop productivity. Investment in irrigation infrastructure and developing optimum crop plans based on availability of water and other natural resources are priority areas for sustainable development of agriculture in the country.

The level of household income depends, to a large extent, on the types of crops cultivated. Paddy and wheat are the two most important crops in India. Paddy occupies about 45% of the total cultivated area in *kharif* season, and wheat 54% in *rabi* season (Figure 3). Paddy is followed by cotton, soybean, bajra, and maize with their respective shares of 10.9, 9.6, 8.7 and 7.2% in *kharif* season. Major crops in *rabi* season are wheat, paddy (in few states paddy is also grown in *rabi* season), gram, and maize. Farmers' crop choice is influenced by a variety of factors, including crop revenue, access to resources, climate suitability, and regional food habits. The improvement in productivity and fair price realization, therefore, are the important measures for developing remunerative and sustainable cropping pattern.

Figure 3. Cropping pattern adopted by the sample farmers in India, 2018-19 (%)



***Kharif* season (visit 1)**

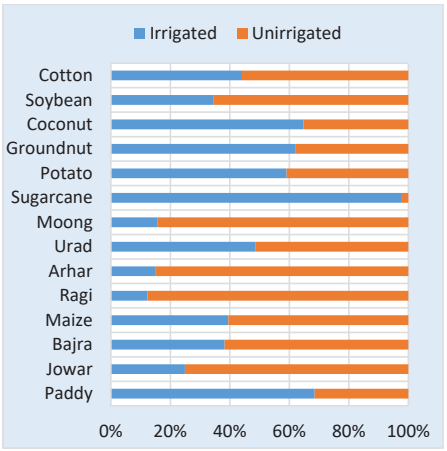


***Rabi* season (visit 2)**

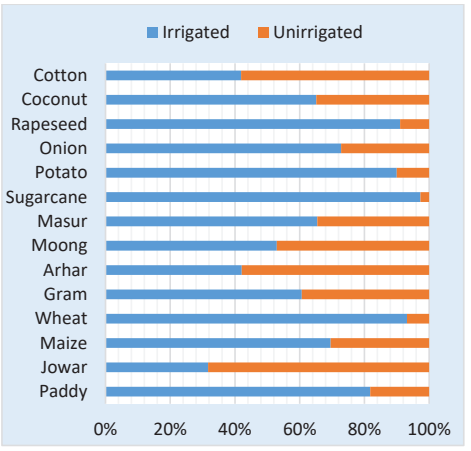
2.1 Irrigation Coverage

Irrigation is the most important factor influencing agricultural productivity. Although farmers' access to irrigation has improved significantly, still about half of the cultivated area remains unirrigated. Irrigation coverage varies significantly across crops and regions. Figure 4 shows crop-wise distribution of irrigated area in 2018-19. The crops grown during *rabi* season are more irrigated than the crops grown during kharif season. This is obvious as monsoon rains are concentrated in *kharif* season. Millets and pulses are primarily cultivated as rainfed crops. On the other hand, crops like sugarcane, wheat, and potato are cultivated in the areas having better irrigation infrastructure. Access to irrigation bears a positive association with the productivity. It also prompts farmers to shift from low water-intensive crops like millets and pulses to high water-intensive crops. Investment in irrigation infrastructure and developing optimum crop plans based on availability of water and other natural resources are priority areas for the sustainable development of agriculture.

Figure 4. Crop-wise irrigation coverage in sample farms in India, 2018-19 (%)



***Kharif* season (visit 1)**



***Rabi* season (visit 2)**

2.2 Irrigation and Productivity

There is a significant positive association between irrigation and agricultural productivity. For instance, the average yield of irrigated paddy is 37.45 quintal/hectare as compared to 23.39 quintals/hectare for rainfed paddy (Figure 5a). Similar yield gains due to irrigation are observed for other crops as well (Figure 5b). Besides, irrigation also ensures stability in agricultural output, especially during unfavorable weather and

climatic conditions. This makes irrigation an adaptation measure against changing climate. This indicates scope to improve level and stability in food production by improving irrigation infrastructure and its efficiency.

Figure 5a. Crop productivity (kg/ha) in irrigated and un-irrigated conditions in *Kharif* season (visit 1) in India, 2018-19

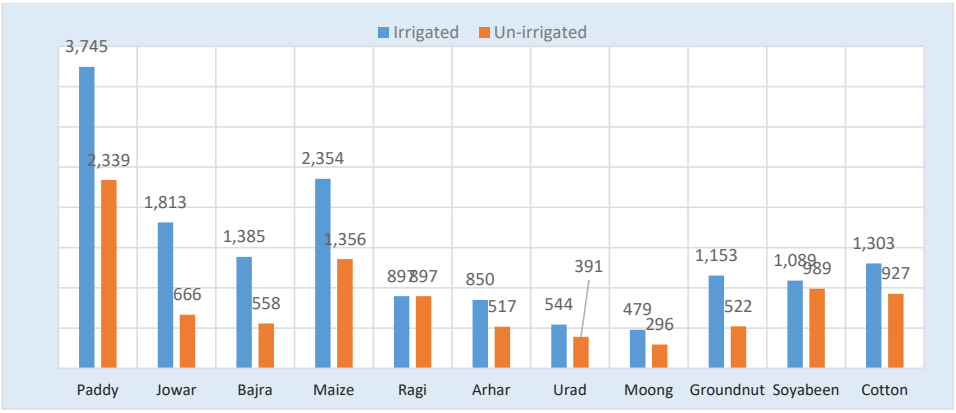
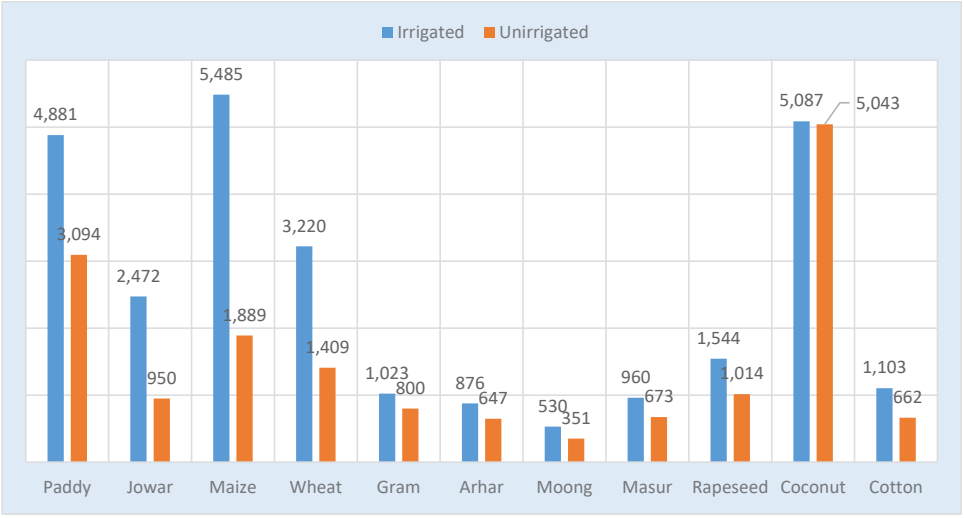


Figure 5b. Crop productivity (kg/ha) in irrigated and un-irrigated conditions in *rabi* season (visit 2) in India, 2018-19



♦♦♦

3 Household Income

Although overall income for agricultural households has increased between 2012-13 and 2018-19, the share of income from crop cultivation has declined. Much of the increase in income has come from wages and animal farming. During 2002-03 to 2012-13, the real income of agricultural households grew by 2.47% per year, but it has decelerated to 1.5% per year during 2012-13 to 2018-19. Jharkhand and Odisha are the lowest income state in 2018-19. Other states which have considerably low income are Bihar, Chhattisgarh, Telangana, Uttar Pradesh, and West Bengal. Income growth between 2012-13 to 2018-19 is the highest in Uttarakhand, Meghalaya, Bihar, and Rajasthan, and the lowest in Jharkhand, Nagaland, Odisha, and Madhya Pradesh.

3.1 Income Sources

Agricultural households derive income from several sources including cultivation of crops, animal husbandry, wages and salaries, and non-farm business activities. Income from crops is estimated as the value of the main product and by-product minus the cost of inputs. Income from animal husbandry (including fisheries) is the income from the sale of animals and the outputs produced minus the costs incurred. The income earned as laborers (outside their households) within and outside agriculture is classified as the income from wages and salaries. The net income from non-farm business enterprises also falls in this category. In the 77th round of SAS-LLH, the income from leased-out land has also been considered for inclusion in the household income. Income has been compared for 2002-03, 2012-13, and 2018-19 after deflating these at 2018-19 prices. The deflators are the Consumer Price Index for Agriculture Labour (CPIAL) and the GDP deflator.

Table 6 shows the nominal and real income of agricultural households. In nominal terms, the mean household income in 2018-19 is estimated at Rs 10,218. The comparable figures for 2012-13 and 2002-03 are Rs 6426 and Rs 2115, respectively. In 2002-03 almost half of the income came from non-farm sources. The share of farm income increased to 60% in 2012-13 but again fell to 52% in 2018-19.

While the overall income has increased, the share of income from crops has declined. The increase in income between 2012–13 to 2018–19 has

been largely driven by income from wages and animal farming. In 2018–19, wages contributed 40% to the household's income and followed by income from crops (37%). This indicates the declining role of crop cultivation as a livelihood option. Between 2002-03 and 2012-13, the real income (with GDP deflator) grew by 2.47% per year, which decelerated to 1.5% between 2012-13 and 2018-19 (Figure 6). However, higher growth is observed when real incomes are derived using CPIAL as the deflator.

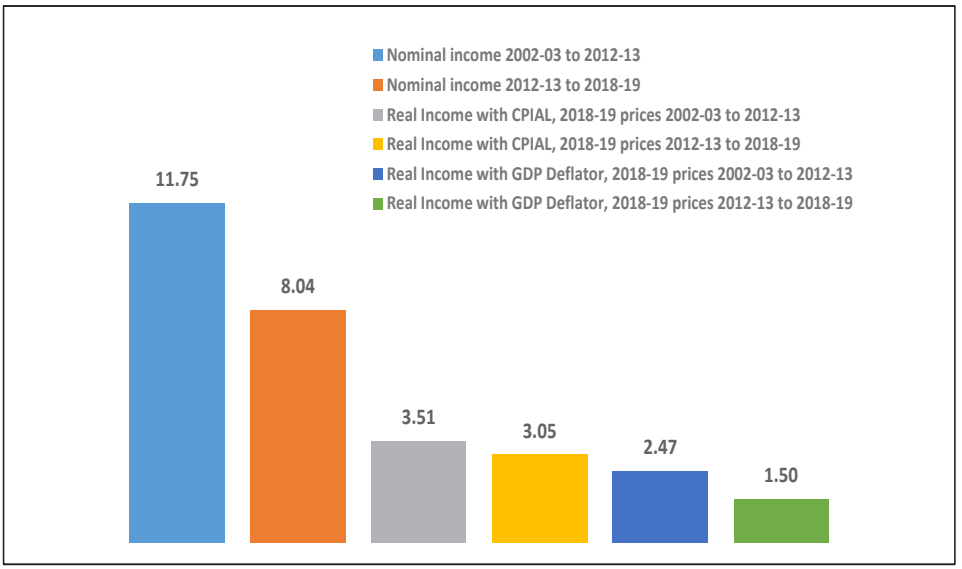
Table 6. Average monthly income of agriculture households

Income	Year	Wages	Crop production	Farming of animals	Leasing out of the land	Non-farm business	Total income
Nominal Income (Rs.)	**2002-03**	819	969	91		236	2115
		39	*46*	*4*		*11*	*100*
	2012-13	2071	3081	763		512	6426
		32	*48*	*12*		*8*	*100*
	2018-19	4063	3798	1582	134	641	10218
		40	*37*	*15*	*1*	*6*	*100*
Real Income with CPIAL, 2018-19 prices (Rs.)	**2002-03**	2340	2769	260		674	6043
		39	*46*	*4*		*11*	*100*
	2012-13	2749	4090	1013		680	8532
		32	*48*	*12*		*8*	*100*
	2018-19	4063	3798	1582	134	641	10218
		40	*37*	*15*	*1*	*6*	*100*
Real Income with GDP Deflator, 2018-19 prices (Rs.)	**2002-03**	2836	3355	315		817	7323
		39	*46*	*4*		*11*	*100*
	2012-13	3011	4480	1109		745	9344
		32	*48*	*12*		*8*	*100*
	2018-19	4063	3798	1582	134	641	10218
		40	*37*	*15*	*1*	*6*	*100*
Growth in real income with GDP deflator (%)	**2002-03 to 2012-13**	*0.60*	*2.93*	*13.41*		*-0.93*	*2.47*
	2012-13 to 2018-19	*5.12*	*-2.72*	*6.09*		*-2.46*	*1.50*

Source: SAS-LLH, various rounds
Note: Numbers in italics indicate the share in total income

Income from farming animals has risen continuously. Animal and fish farming are emerging as high growth sectors. To our dismay, the income from crop cultivation has declined annually at 2.72% during 2012-13 to 2018-19. The reasons for the same have been discussed subsequently. The wage income witnessed a surge turning out to be the most important income source for farm households.

Figure 6. Growth in household income, all India



3.2 Income Growth across States

Table 7 provides the state-wise farm household incomes. Jharkhand has the lowest household income followed by Odisha. In Jharkhand and Odisha, the average monthly household income in 2018–19 was Rs. 4895 and Rs. 5112, respectively. In Bihar, Chhattisgarh, Telangana, Uttar Pradesh, Jharkhand, Madhya Pradesh, Odisha and West Bengal, it is less than Rs 10,000. The states with the highest income growth between 2012–13 and 2018–19 are Uttarakhand (15.0%), Meghalaya (8.2%), Bihar (6.8%), and Rajasthan (4.8%). Jharkhand (-8.2%), Nagaland (-8.1%), Odisha (-6.7%), and Madhya Pradesh (-4.5%) witnessed negative growth. In Uttarakhand, growth has come from non-farm business (22.5%) and farming of animals (20.9%), while in Bihar (27.8%) and Rajasthan (11.3%) it was driven by animal husbandry (see Table 9). In Madhya Pradesh, the slowdown is mostly due to the negative growth in crop income (-8.0%) and in Odisha due to a decline in income from animal farming (-23.3%).

There are some states where the growth has fluctuated drastically. For instance, Karnataka had a negative growth (-0.1%) between 2012-13 and 2018-19. This deceleration occurred primarily due to high negative growth in non-farm business income. Similarly, Madhya Pradesh recorded negative growth (-4.5%) between 2012-13 and 2018-19 (Table 8).

Table 7. Nominal and real household monthly income across the states (Rs)

States	Nominal income		Real Income with CPIAL, 2018-19 prices		Real Income with GDP Deflator, 2018-19 prices	
	2012-13	2018-19	2012-13	2018-19	2012-13	2018-19
Andhra Pradesh	5979	10,480	8377	10480	8404	10480
Arunachal Pradesh	10869	19,225	13801	19225	16156	19225
Assam	6695	10,675	8501	10675	9053	10675
Bihar	3558	7,542	4324	7542	5079	7542
Chhattisgarh	5177	9,677	6206	9677	7478	9677
Gujarat	7926	12,631	10610	12631	10729	12631
Haryana	14434	22,841	19189	22841	18768	22841
Himachal Pradesh	8777	12,153	11845	12153	10610	12153
Jammu & Kashmir	12683	18,918	16615	18918	16432	18918
Jharkhand	4721	4,895	5739	4895	8159	4895
Karnataka	8832	13,441	12153	13441	13517	13441
Kerala	11888	17,915	17914	17915	20074	17915
Madhya Pradesh	6210	8,339	7443	8339	11020	8339
Maharashtra	7386	11,492	9620	11492	9061	11492
Manipur	8842	11,227	12592	11227	13984	11227
Meghalaya	11792	29,348	15233	29348	18245	29348
Mizoram	9099	17,964	12345	17964	14043	17964
Nagaland	10048	9,877	13633	9877	16343	9877
Odisha	4976	5,112	6356	5112	7729	5112
Punjab	18059	26,701	23649	26701	25296	26701
Rajasthan	7350	12,520	9782	12520	9409	12520
Sikkim	6798	12,447	9223	12447	11227	12447
Tamil Nadu	6980	11,924	10745	11924	9557	11924
Telangana	6311	9,403	8842	9403	9527	9403
Tripura	5429	9,918	7558	9918	9470	9918
Uttarakhand	4701	13,552	5869	13552	5844	13552
Uttar Pradesh	4923	8,061	6148	8061	6858	8061
West Bengal	3980	6,762	4972	6762	5882	6762
All India	6426	10,218	8532	10218	9344	10218

Source: Authors' computation

Table 8. Growth in monthly household incomes across states, 2012-18

States	Nominal income	Real Income with CPIAL, 2018-19 prices	Real Income with GDP Deflator, 2018-19 prices
Andhra Pradesh	9.81	3.80	3.75
Arunachal Pradesh	9.97	5.68	2.94
Assam	8.09	3.87	2.78
Bihar	13.34	9.72	6.81
Chhattisgarh	10.99	7.68	4.39
Gujarat	8.08	2.95	2.76
Haryana	7.95	2.95	3.33
Himachal Pradesh	5.57	0.43	2.29
Jammu & Kashmir	6.89	2.19	2.38
Jharkhand	0.61	-2.62	-8.16
Karnataka	7.25	1.69	-0.09
Kerala	7.07	0.00	-1.88
Madhya Pradesh	5.04	1.91	-4.54
Maharashtra	7.65	3.01	4.04
Manipur	4.06	-1.89	-3.59
Meghalaya	16.41	11.55	8.24
Mizoram	12.00	6.45	4.19
Nagaland	-0.29	-5.23	-8.05
Odisha	0.45	-3.57	-6.66
Punjab	6.73	2.04	0.90
Rajasthan	9.28	4.20	4.88
Sikkim	10.61	5.12	1.73
Tamil Nadu	9.34	1.75	3.76
Telangana	6.87	1.03	-0.22
Tripura	10.56	4.63	0.77
Uttarakhand	19.30	14.97	15.05
Uttar Pradesh	8.57	4.62	2.73
West Bengal	9.24	5.26	2.35
All India	8.04	3.05	1.50

Source: Authors' computation

3.3 Growth across Income Sources

Between 2012-13 and 2018-19, the highest growth in crop income was observed in Meghalaya (13.2), Uttarakhand (9.0), Sikkim (6.4), and Mizoram (3.6). Assam (-8.9), Jammu & Kashmir (-10.9), Jharkhand (-12.8), and Nagaland (-14.7) witnessed negative growth in it (Table 9). Northeastern states are thus clearly visible at both contours. Bihar (27.8), Uttarakhand (20.9), Arunachal Pradesh (15.8), and Maharashtra (15.1) ranked highest in livestock income growth, while Sikkim (-2.7), Meghalaya (-3.1), Jharkhand (-14.1), and Odisha (-23.3) ranked the lowest. The highest growth in non-farm business income has been recorded in Chhattisgarh (146.1%), Mizoram (77.7%), Arunachal Pradesh (29.1%), and Tripura (24.4%), while the lowest growth has been recorded in Jharkhand (-14.7%), Sikkim (-17.3%), Meghalaya (-18.4%), and Karnataka (-19.3%). Wage income growth has been the highest in Assam (19.3%), Uttarakhand (18.8%), Uttar Pradesh (10.4%), and Haryana (9.6%) and the lowest in Punjab (-1.9%), Jharkhand (-2.2%), Manipur (-6.1%) and Nagaland (-12.4%).

3.4 Drivers of Income Growth

Table 10 provides the details of crop income growth and changes in the area and yield of major crops during 2012-13 to 2018-19. The crop income has registered negative growth at the aggregate level. Unfortunately, the majority of the states have only modest or even negative growth in crop income. This a matter of serious concern. The situation is alarming in Jharkhand (-12.8), Jammu & Kashmir (-10.9), Assam (-8.9), and Madhya Pradesh (-8.0). The reasons are explored for the decline in crop income. To probe further, the changes in area, productivity, and prices for major crops have been examined at the state level. The crops include paddy, wheat, maize, gram, pigeon pea, groundnut, rapeseed & mustard, soybean, cotton, and sugarcane. In Jharkhand, there is a decline in the yields of major crops like groundnut, maize, paddy, soybean, and wheat. Paddy is the most important crop of Jharkhand, covering more than half of the total cropped area; a decline in its yield and price (Figure 7) could be the reason for the decline in crop revenues.

Soybean is one of the most important crops in Madhya Pradesh. The state produces around half of the country's soybean. A decline in the area and productivity of soybean in Madhya Pradesh has been observed in recent years. Similar trends are seen in Odisha, where a decline in area and yield of major crops are contributing to negative growth in crop income. Note that paddy covers more than two-thirds of the state's total cropped area. Further, price indices remain much lower than those in other major rice-producing states.

Table 9. Growth in household Income, 2012/13 to 2018/19

States	Wages	Crop production	Farming of animals	Non-farm business	Total income
Andhra Pradesh	5.6	-0.6	5.2	2.8	3.7
Arunachal Pradesh	-0.6	-8.4	15.8	29.1	2.9
Assam	19.3	-8.9	0.6	11.9	2.8
Bihar	4.8	1.9	27.8	5.7	6.8
Chhattisgarh	8.9	-1.8	-	146.1	4.4
Gujarat	3.3	1.4	4.9	-5.4	2.8
Haryana	9.6	-1.9	2.6	14.3	3.3
Himachal Pradesh	4.6	-5.0	6.2	4.9	2.3
Jammu & Kashmir	4.2	-10.9	14.0	2.3	2.4
Jharkhand	-2.2	-12.8	-14.1	-14.7	-8.2
Karnataka	1.9	-1.6	10.4	-19.3	-0.1
Kerala	2.4	-7.9	1.3	-6.4	-1.9
Madhya Pradesh	0.9	-8.0	-0.1	-2.8	-4.5
Maharashtra	8.5	0.1	15.1	-3.1	4.0
Manipur	-6.1	-5.8	1.0	6.0	-3.6
Meghalaya	2.9	13.2	-3.1	-18.4	8.2
Mizoram	2.5	3.6	4.6	77.7	4.2
Nagaland	-12.4	-14.7	9.1	-0.5	-8.1
Odisha	-0.1	-5.4	-23.3	-9.9	-6.7
Punjab	-1.9	-3.1	11.5	-0.8	0.9
Rajasthan	8.7	-1.2	11.3	1.6	4.9
Sikkim	3.9	6.4	-2.7	-17.3	1.7
Tamil Nadu	8.5	0.1	4.8	-11.1	3.8
Telangana	5.2	-4.2	3.4	11.3	-0.2
Tripura	4.5	-8.1	10.0	24.4	0.8
Uttarakhand	18.8	9.0	20.9	22.5	15.0
Uttar Pradesh	10.4	-3.1	10.3	-4.9	2.7
West Bengal	2.9	1.1	5.7	-0.4	2.4
All India	5.1	-2.7	6.1	-2.5	1.5

Punjab presents the most glaring example. Punjab recorded the highest income during 2012-13. However, the state registered a decline in crop income during 2012-13 to 2018-19. Expansion of 'mono-cropping', of rice in kharif season and wheat in the rabi season, has deprived Punjab farmers of attaining potential revenue, which could have come from producing a range of crops (Gulati et al., 2018). Rice and wheat have largely replaced coarse cereals and nutrient-rich grains. The average number of crops cultivated by Punjab farmers has decreased from 21 in the 1960s to 9 now (Jodhka, 2021). Thus, diversification could pave the way for boosting crop incomes. Similarly, other states showing negative growth in crop incomes are facing concerns either because of a decline in area under major crops or in their yields summarized in Table 10.

Only four major agricultural states—West Bengal (1.1%), Gujarat (1.4%), Bihar (1.9%), and Uttarakhand (9.0%)—witnessed positive growth of more than one percent in crop incomes. On the contrary, some states have shown positive growth, but their numbers are few. Bihar and Uttarakhand present a peculiar case, as the duo evidenced positive income growth despite negative growth in GSVA. Price growth has been favorable for maize, rapeseed & mustard in Bihar.

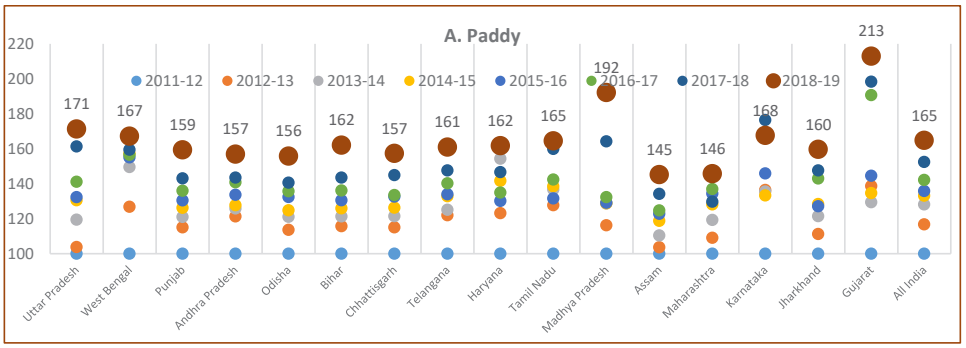
Income from farming of animals includes incomes from dairy, poultry, fisheries, and small ruminants. Growth rates in relevant parameters related to livestock and fisheries (2012/13 to 2018/19) are presented in Table 11. There has been an astounding growth in livestock income in Bihar, Uttarakhand, Maharashtra, Jammu & Kashmir, Punjab, Rajasthan, Karnataka, and Uttar Pradesh. Bihar experienced much appreciable income growth due to the increase in milch cattle and buffaloes. Growth was noticed in the population of both exotic and indigenous cattle. Milk yield also improved. The state observed tremendous growth in poultry meat and inland fish production. Odisha observed a decline in milch animals, milk yield, and meat production. The price of milk has remained subdued in Jharkhand (Figure 8). Uttarakhand has done exceedingly well in income from animal farming. Such situations need in-depth investigations to identify triggers.

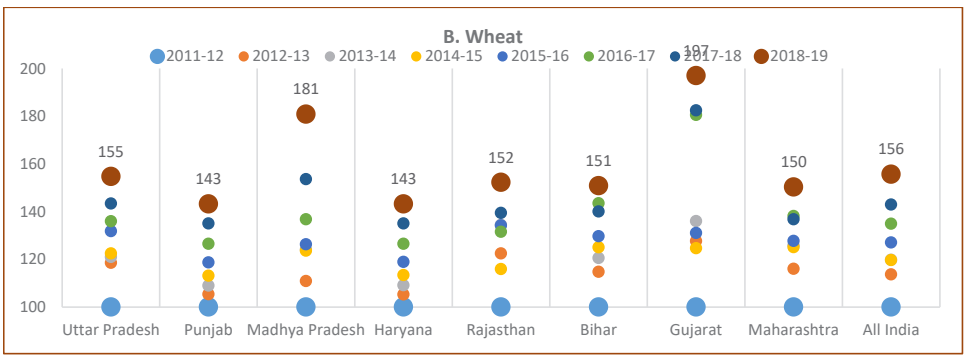
Table 10. Sources of growth in the crop sector (2012/13 to 2018/19)

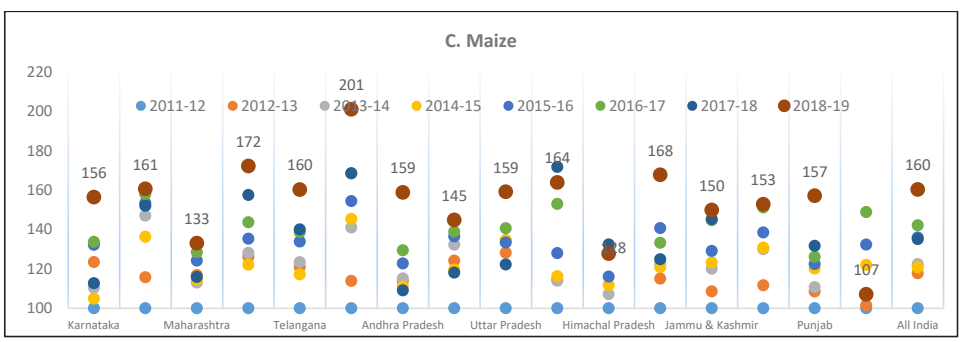
States	Growth in crop income	Growth in crop GSVA*	Decline in major crop area (%)	Decline in major crop yield (%)	Share of selected ten crops
Jharkhand	-12.8	-1.33	-	Groundnut (-1.72), Maize (-0.05), Paddy (-1.42), Soybean (-8.15, wheat (-0.41)	44
Jammu & Kashmir	-10.9	2.18	Paddy (-2.5), R&M (-3.3),	Paddy (-4.00)	26
Assam	-8.9	2.02	Arhar (-2.6), wheat (-10.4)	Arhar (-1.07)	26
Madhya Pradesh	-8.0	4.35	Soybean (-1.4)	Cotton (-0.85)	51
Kerala	-7.9	-3.49	Arhar (-24.2), Groundnut (-19.7), Cotton (-51.7)	-	3
Odisha	-5.4	-3.23	Gram (-6.0), Groundnut (-14.1), Maize (-11.5), Paddy (-0.4), R&M (-9.7), Sugarcane (-15.4), wheat (-34.8)	Groundnut (-1.46), Cotton (-0.88), Sugarcane (-1.27)	41
Punjab	-3.1	0.98	Gram (-1.8), Groundnut (-2.2), Cotton (-9.4), Maize (-3.3)	Maize (-0.35)	75
Himachal Pradesh	-5.0	-2.04	Gram (-3.8), Paddy (-7.6), Soybean (-0.8)	Sugarcane (-4.77)	23
Telangana	-4.2	-3.29	Gram (-2.0), Cotton (-3.8), Maize (-3.7), Soybean (-4.6), Sugarcane (-6.8),	Gram (-1.98), Cotton (-4.37), Maize (-1.71), R&M (-2.84), Soybean (-1.09), Sugarcane (-2.77)	66
Uttar Pradesh	-3.1	2.27	Soybean (-7.1)	Soybean (-2.72)	56
Haryana	-1.9	2.11	Arhar (-22.2), Gram (-3.3), Groundnut (-2.9), Cotton (-5.1), Maize (-6.66), Paddy (-0.7)	Groundnut (-2.40), Paddy (-0.56), Cotton (-7.54)	68
Chhattisgarh	-1.8	2.47	Paddy (-1.5) R&M (-7.5), Soybean (-11.9)	Arhar (-3.06), Paddy (-0.90), Soybean (-9.88)	44
Karnataka	-1.6	2.62	Gram (-0.70), Groundnut (-0.9), Cotton (-1.9), Maize (-0.3), Paddy (-2.1), R&M (-10.4), Sugarcane (-1.8), wheat (-1.8)	Gram (-4.53), Cotton (-2.79), Maize (-0.11), R&M (-16.37), Soybean (-2.22), Sugarcane (-0.77)	34
Rajasthan	-1.2	-0.86	Arhar (-0.6), Soybean (-1.2)	-	44
Andhra Pradesh	-0.6	4.70	Arhar (-5.0), Gram (-9.4), Groundnut (-3.6), Cotton (-2.6), Maize (-1.9), R&M (-7.9), Soybean (-11.9), Sugarcane (-7.2)	Arhar (-12.48), Gram (-8.79), R&M (-6.50), Soybean (-7.58), Cotton (-0.87)	32
Maharashtra	0.1	0.19	Groundnut (-2.5), Cotton (-2.7), Paddy (-0.3), R&M (-1.7),	Arhar (-0.29), Groundnut (-1.12), Cotton (-2.82), Soybean (-2.43)	45
Tamil Nadu	0.1	-1.29	Gram (-0.3), Cotton (-8.0), R&M (-11.6), Sugarcane (-11.8)	Cotton (-8.68), R&M (-0.72), Sugarcane (-0.43)	29
West Bengal	1.1	2.29	Groundnut (-0.4), Soybean (-1.4), Sugarcane (-12.8), wheat (-16.9)	Arhar (-0.38), Gram (-0.66), Sugarcane (-6.35)	29
Gujarat	1.4	2.95	Cotton (-4.3), R&M (-0.8), Sugarcane (-2.4), wheat (-5.4)	Sugarcane (-1.95), wheat (-0.30)	47
Bihar	1.9	-0.86	Arhar (-5.3), Gram (-2.4), Groundnut (-0.8)	Arhar (-1.68), Gram (-1.07), Groundnut (-0.16)	49
Uttarakhand	9.0	-1.51	Groundnut (-0.9), Soybean (-12.7)	Groundnut (-0.45), Soybean (-8.46)	43
All India	-2.7		Cotton (-3.2), Soybean (-0.8)	Cotton (-3.28), Soybean (-0.28)	45

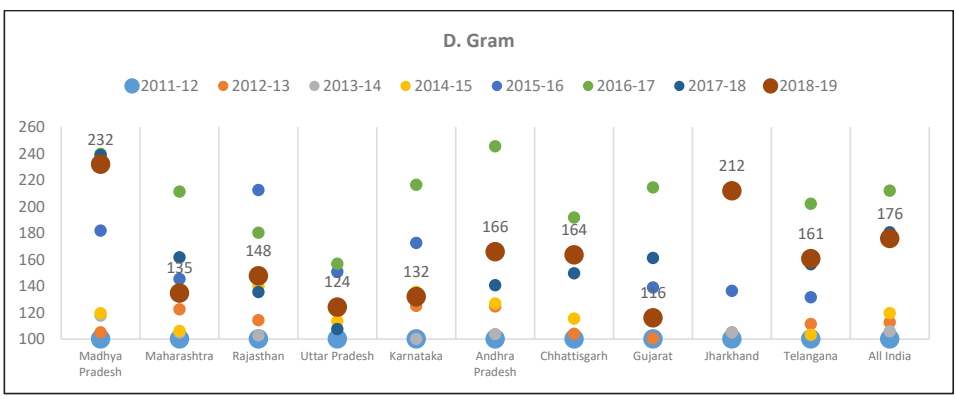
Source: Authors' computation
Note: * GSVA refers to the gross state value added at 2011-12 prices

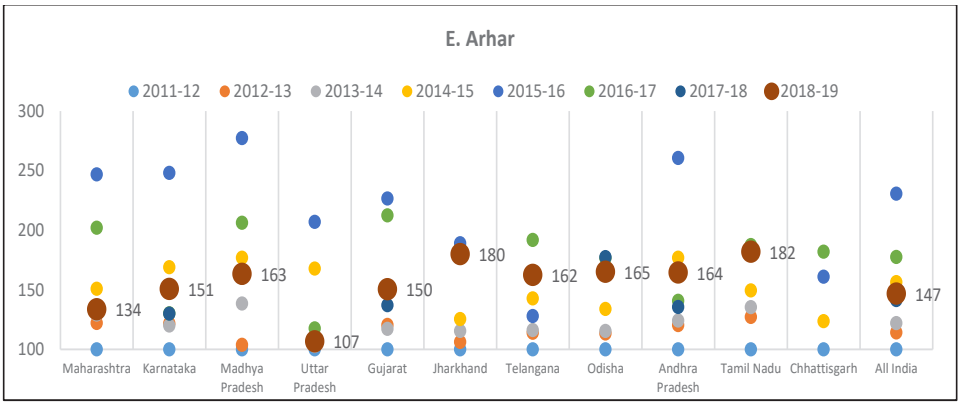
Figure 7. Growth in price factors for selected crops










E. Arhar
2011-12
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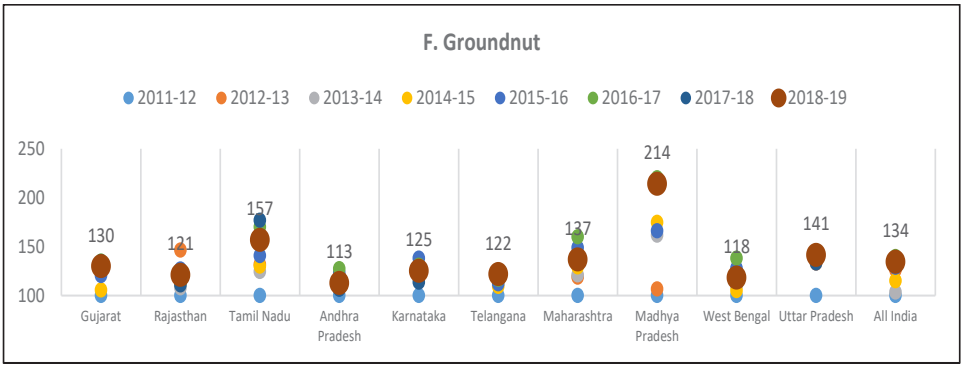
Maharashtra
Karnataka
Madhya Pradesh
Uttar Pradesh
Gujarat
Jharkhand
Telangana
Odisha
Andhra Pradesh
Tamil Nadu
Chhattisgarh
All India


F. Groundnut
2011-12
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Gujarat
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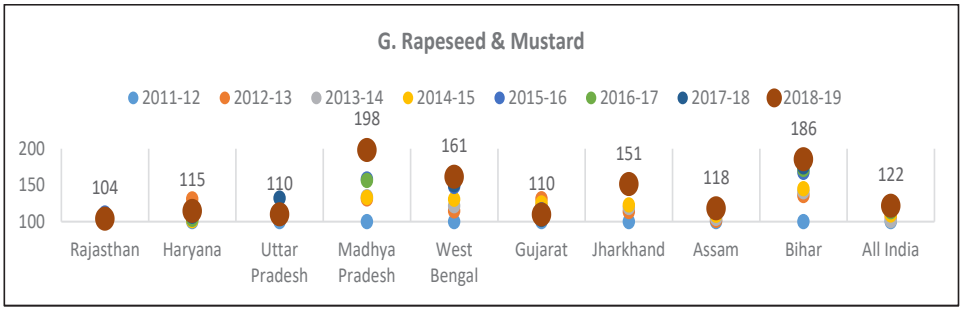
Andhra Pradesh
Karnataka
Telangana
Maharashtra
Madhya Pradesh
West Bengal
Uttar Pradesh
All India


G. Rapeseed & Mustard
2011-12
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2016-17
2017-18
2018-19
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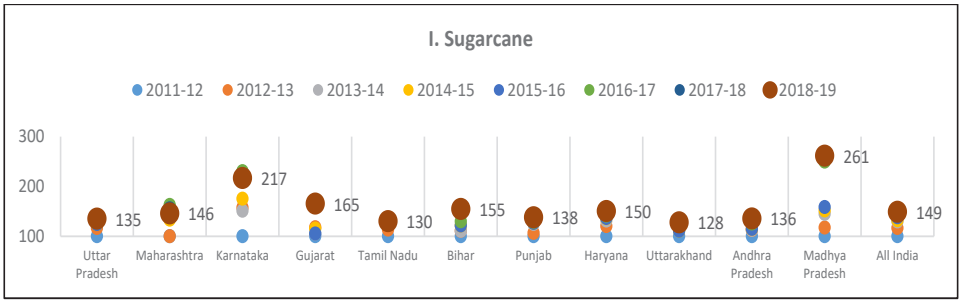
Rajasthan
Haryana
Uttar Pradesh
Madhya Pradesh
West Bengal
Gujarat
Jharkhand
Assam
Bihar
All India


I. Sugarcane
2011-12
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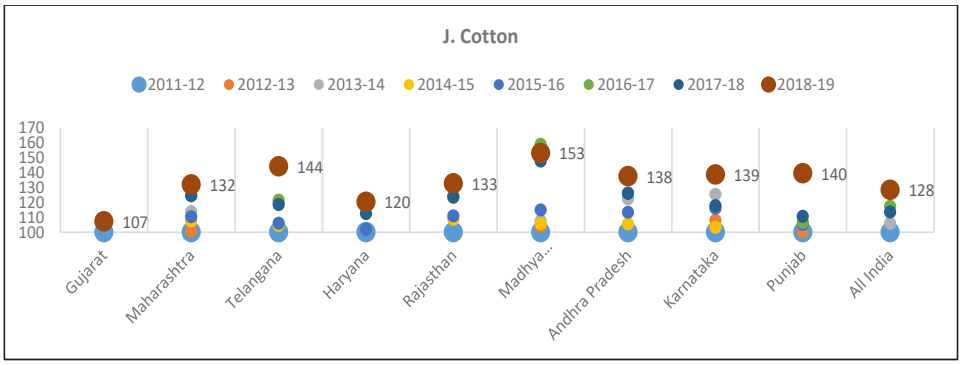
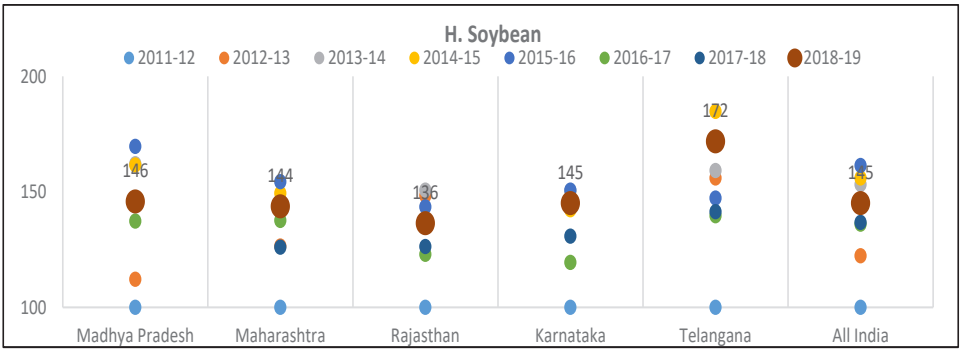
Uttar Pradesh
Maharashtra
Karnataka
Gujarat
Tamil Nadu
Bihar
Punjab
Haryana
Uttarakhand
Andhra Pradesh
Madhya Pradesh
All India





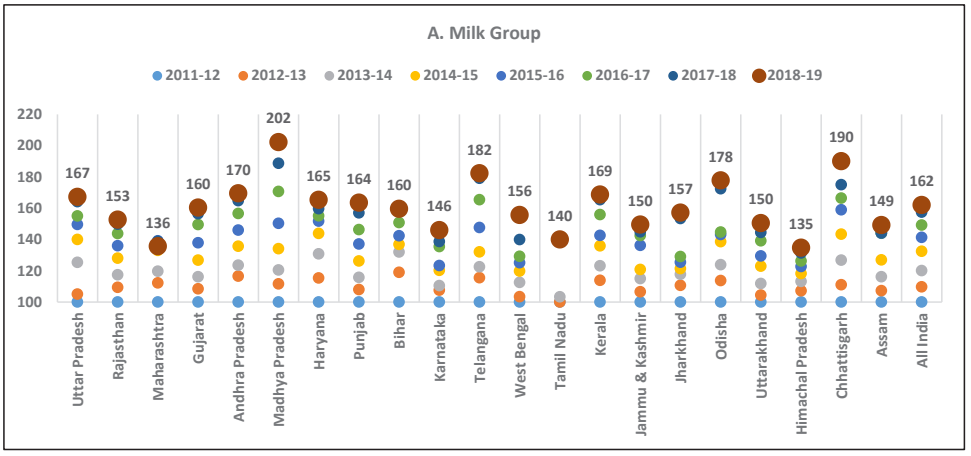
Growth of milk production has been the highest in Madhya Pradesh (10.67%), followed by Rajasthan (9.95%), Jammu & Kashmir (8.82%), Haryana (7.19%), Telangana (6.36%), and Bihar (6.24%). Poultry meat production growth has been the highest in Punjab (80.17%), followed by Tamil Nadu (74.95%), Haryana (61.74%), Uttar Pradesh (58.58%), and Gujarat (56.61%). The growth performance of fish production has been better in Uttarakhand, Jharkhand, Andhra Pradesh, Haryana, and Madhya Pradesh. Inland fishing performed better in Andhra Pradesh, Jharkhand, Chhattisgarh, Odisha, and Madhya Pradesh, while Andhra Pradesh, Assam, Odisha, Telangana, Tamil Nadu, and Gujarat performed well in marine fisheries.

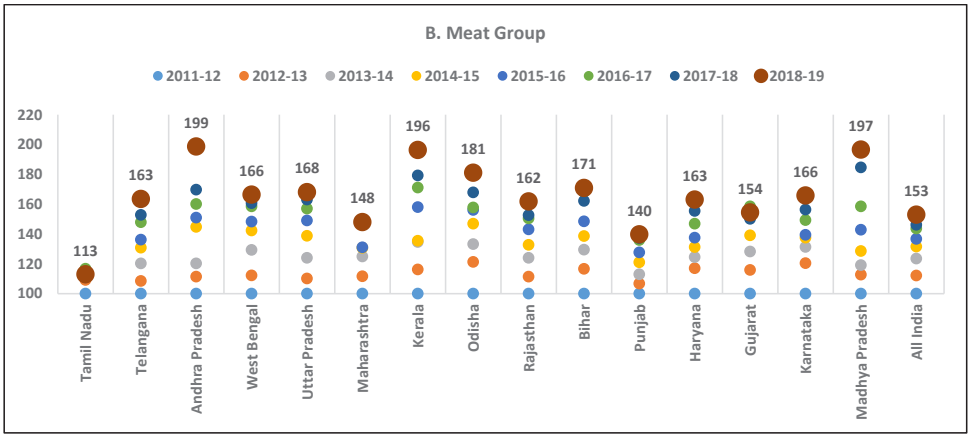
Table 11. Growth in the livestock and fisheries sector (2012/13 to 2018/19, %)

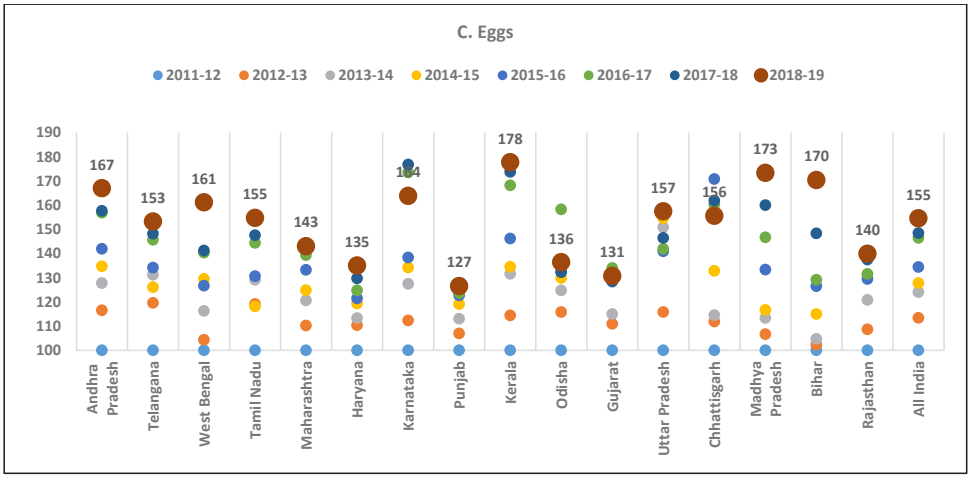
States	Income fom farming of animals	Livestock GSVA	Milk Group					Poultry meat production	Fisheries Sector		
			Milk production	Milch animals			Milk yield		Fish production	Inland fisheries VOP	Marine fisheries VOP
				Crossbred milch cattle	Indigenous milch cattle	Milch buffaloes					
Andhra Pradesh	5.2	9.27	3.02	2.00	-2.31	-1.69	7.67	8.03	14.47	15.05	29.79
Assam	0.6	1.94	1.68	8.05	0.72	-1.77	2.80	-4.63	4.70	4.39	15.54
Bihar	27.8	5.57	6.24	2.53	6.92	1.11	1.68	36.68	7.02	7.02	-
Chhattisgarh	-	4.17	5.09	6.93	1.12	0.46	1.98	9.95	11.12	13.04	-
Gujarat	4.9	4.27	5.54	9.59	-2.16	0.64	0.91	56.61	-0.56	-1.49	4.40
Haryana	2.6	6.48	7.19	-1.27	3.62	-4.87	2.32	61.74	13.07	10.81	-
Himachal Pradesh	6.2	3.90	4.57	2.50	-4.67	-1.77	2.04	-9.44	7.48	7.48	-
Jammu & Kashmir	14.0	5.40	8.82	0.73	-0.93	-0.60	4.03	16.79	-33.00	-0.02	-
Jharkhand	-14.1	4.75	4.44	10.84	4.57	1.94	-2.58	-6.01	14.54	14.56	-
Karnataka	10.4	4.60	5.08	4.09	-5.42	-2.65	1.77	31.41	1.39	-1.62	4.21
Kerala	1.3	-0.34	-1.44	0.62	0.54	-4.51	8.39	3.13	-1.82	5.92	2.61
Madhya Pradesh	-0.1	10.18	10.67	11.33	0.09	3.39	2.31	-0.24	11.97	11.96	-
Maharashtra	15.1	5.48	4.95	4.20	-1.81	0.04	5.19	40.37	0.29	-2.40	1.54
Odisha	-23.3	2.63	4.23	3.91	-1.88	-6.43	0.11	-3.45	11.35	12.32	15.16
Punjab	11.5	4.29	4.38	1.34	8.57	-2.75	1.61	80.17	6.02	6.10	-
Rajasthan	11.3	7.76	9.95	4.69	0.36	0.60	3.70	-6.67	3.64	9.51	-
Tamil Nadu	4.8	12.32	2.81	3.03	-4.04	-6.05	-3.84	74.95	2.26	-5.81	5.30
Telangana	3.4	6.82	6.36	3.72	-1.68	-0.43	2.54	7.04	5.50	2.53	6.65
Uttar Pradesh	10.3	3.06	4.64	8.02	-2.34	0.67	1.18	58.58	-62.56	7.37	-
Uttarakhand	20.9	2.91	3.23	3.21	-0.91	-2.03	-1.85	41.52	199.02	3.87	-
West Bengal	5.7	3.56	2.39	2.99	2.41	1.61	3.64	45.89	2.76	2.66	3.83
All India	6.1	5.99	6.13	4.06	0.11	0.03	2.95	10.86	6.80	7.03	14.19

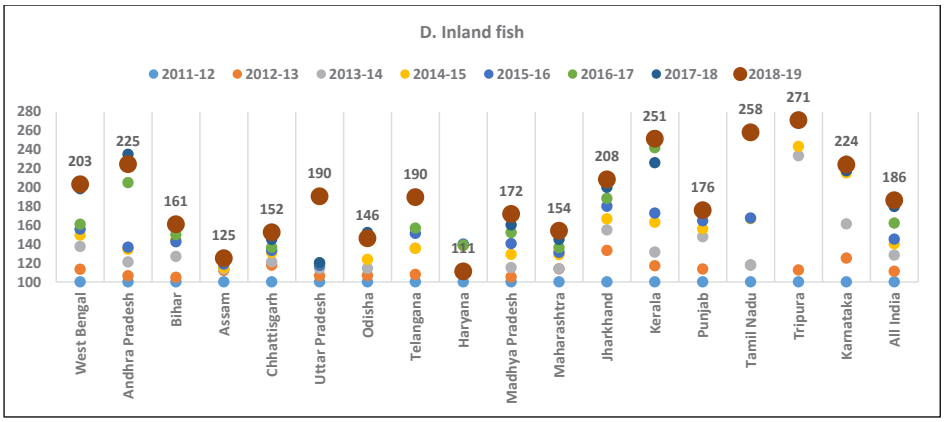
Source: Authors' computation

Figure 8. Growth in price factors for selected livestock and fish categories








D. Inland fish
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
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220
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180
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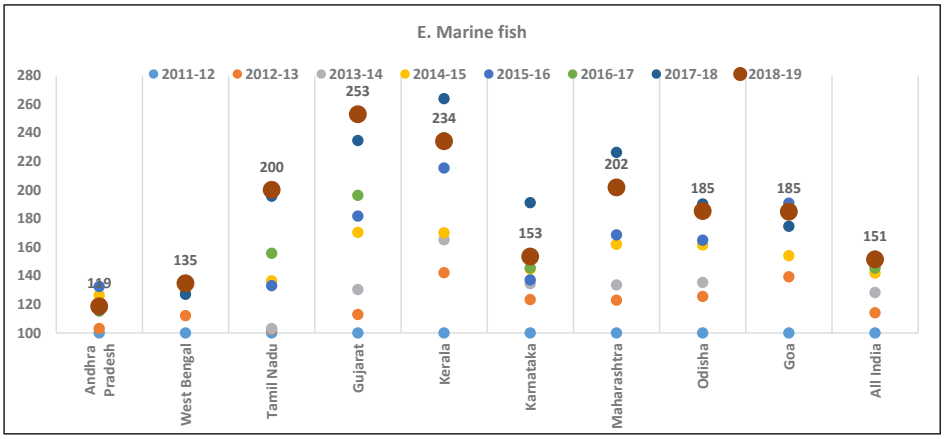
West Bengal
Andhra Pradesh
Bihar
Assam
Chhattisgarh
Uttar Pradesh
Odisha
Telangana
Haryana
Madhya Pradesh
Maharashtra
Jharkhand
Kerala
Punjab
Tamil Nadu
Tripura
Karnataka
All India


E. Marine fish
2011-12
2012-13
2013-14
2014-15
2015-16
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2017-18
2018-19
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Andhra Pradesh
West Bengal
Tamil Nadu
Gujarat
Kerala
Karnataka
Maharashtra
Odisha
Goa
All India

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4 Investment in Agriculture

Farm investment by smallholders remains low. Large farmers with land holding more than 10 hectares invest more than 25 times of those cultivating less than 0.4 hectares. Smallholders invest more in livestock and poultry. On the other hand, more than 70% of the investment on large farms is on farm machinery and implements. However, there is significant variation in farm investment across states.

4.1 Investment Level

Although the share of marginal and small farmers in the total cultivated area has increased, still, their investment level has remained low. A large farmer invested 25 times more than a farmer cultivating less than 0.4 hectares and 13 times more than those cultivating between 0.4 and 1.0 hectares (Table 12).

Table 12. Investment and its composition in agriculture (All-India, 2018-19)

Land Class (ha)	Investment (Rs/ Agri HH, Nominal)*	Investment shares in different components (%)				
		Livestock & poultry	Agricultural machinery & implements	Other productive assets**	Non-farm	Total
0.01 – 0.40	279	43.4	23.7	21.1	11.5	100
0.41 – 1.00	545	25.1	25.1	40.9	8.6	100
1.01 – 2.00	848	21.9	41.4	30.1	6.7	100
2.01 – 4.00	2,109	10.6	47.6	37.8	3.9	100
4.01 – 10.00	3,816	13.1	45.5	35.7	5.7	100
> 10.00	7,088	11.4	70.9	17.6	0.1	100
All	806	20.7	38.8	33.9	6.6	100

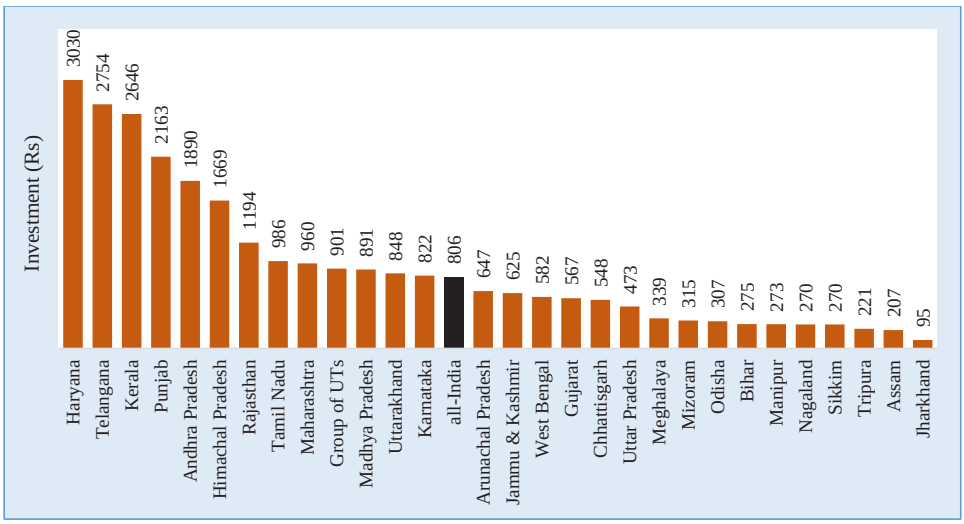
Note: *Gross monthly expenditure on productive assets; **includes land for farm business, building for the farm business, and fish tank used for farm business

Source: SAS-LLH Survey (2018-19)

Smallholders invest more in livestock, poultry and non-farm activities. Large farmers, on the other hand, invest in mechanization. A consistent

decline in investment in livestock and poultry is observed across landholding classes, varying from 43.4% among households with 0.4 hectares of land to around 11.4% among large farmers (Table 12). Similar is the case in non-farm investments. Marginal and small farmers respectively invest 6.7% and 11.5% in non-farm activities, but large farmers barely invested in non-farm activities.

Figure 9. Investment* of agricultural households across the states (2018-19, Rs/agri household)



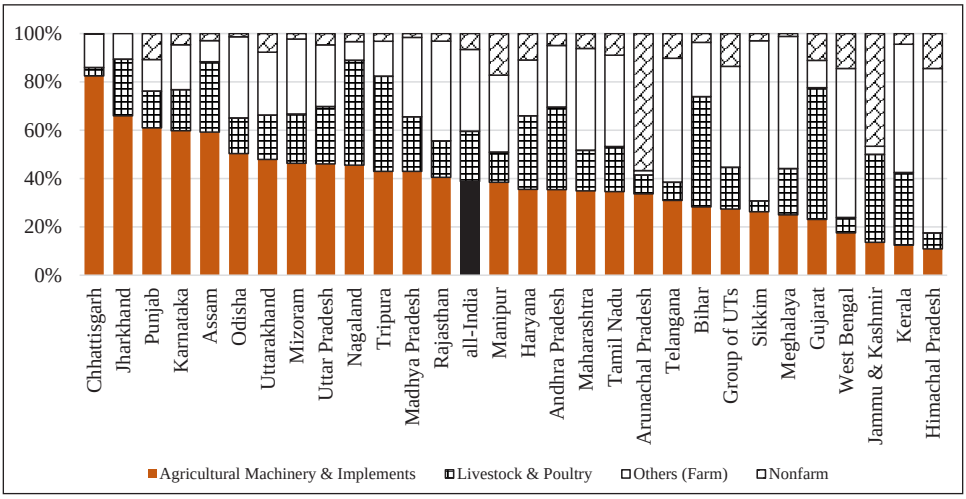
*Note: *Gross monthly expenditure on productive assets*
Source: SAS-LLH Survey (2018-19)

Across states, farmers of Haryana invest more, with an average investment of Rs. 3,030 (Figure 9). In Telangana, Kerala, and Punjab, the investment per household ranges between Rs. 2,000 and Rs. 3,000 and in Andhra Pradesh, Himachal Pradesh, and Rajasthan between Rs. 1,000 and Rs. 2,000. Households in Tamil Nadu, Maharashtra, Madhya Pradesh, Uttarakhand, and Karnataka invest between Rs. 800 and Rs. 1,000. The level of investment in Jharkhand, Assam, Bihar, Odisha and northeastern states is much less than the national average. An agricultural household in Jharkhand invest just Rs.95, which is 3% of the investment that a household in Haryana does.

Investment pattern differ, both within and between high- and low-investment states. In relatively high investment states, the households in Haryana have balanced their investment across different activities, including

livestock, poultry, farm equipment, and other productive assets including farmland and buildings. In Telangana and Kerala, more than 50% of the investment has been made in farmland and buildings (Figure 10). While in Punjab, 60% of the investment is on machinery and implements. In low-investment states, i.e., Jharkhand, Assam, and Odisha, too, farm machinery accounts for more than half of the total investment, while in Bihar it is the livestock and poultry that account for a higher share in the investment.

Figure 10. Investment* composition of agricultural households (%, 2018-19)

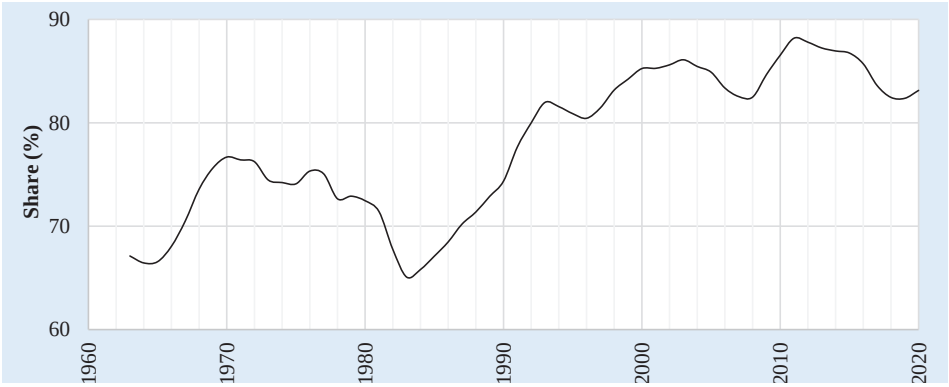


Note: *Gross monthly expenditure on productive assets
Source: SAS-LLH Survey (2018-19);

4.2 Investment Pattern

Farm households have contributed most to the capital investment in agriculture over decades (Figure 11). While the public sector's contribution accelerated for a while during the early Green Revolution, the private sector (farm households) contributed the most. During this phase, much of the irrigation and institutional infrastructure was developed. This ensured cereal self-sufficiency in a short period. The share of public sector rose from 23% in 1970 to 35% in 1983, but declined to 22% in 1991. In the early 1990s, about 80% of the agricultural capital was contributed by farm households. With some fluctuations, it has increased since then.

Figure 11. Contribution of private capital formation in agriculture, All-India



Note: Capital shares are based on 3-year moving average estimates at 2011-12 prices
Source: Agricultural Statistics at a Glance (various years)

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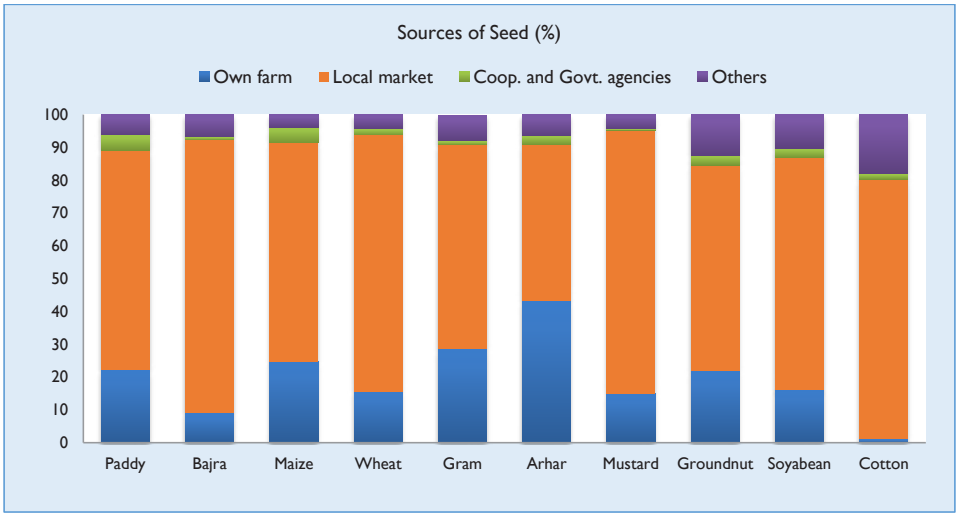
5 Access to Input Markets and Technical Information

Local market is the main source for seeds. Procurement of seeds from cooperatives and government agencies is not very prominent. Local market is also the source of other farm inputs. At the national level, about 41% of the farm households accessed technical advice from various agencies in 2012-13, which increased to 49 percent in 2018-19. Progressive farmers, input dealers, and electronic & print media remain the primary sources of technical advice and information.

5.1 Sources of Seeds

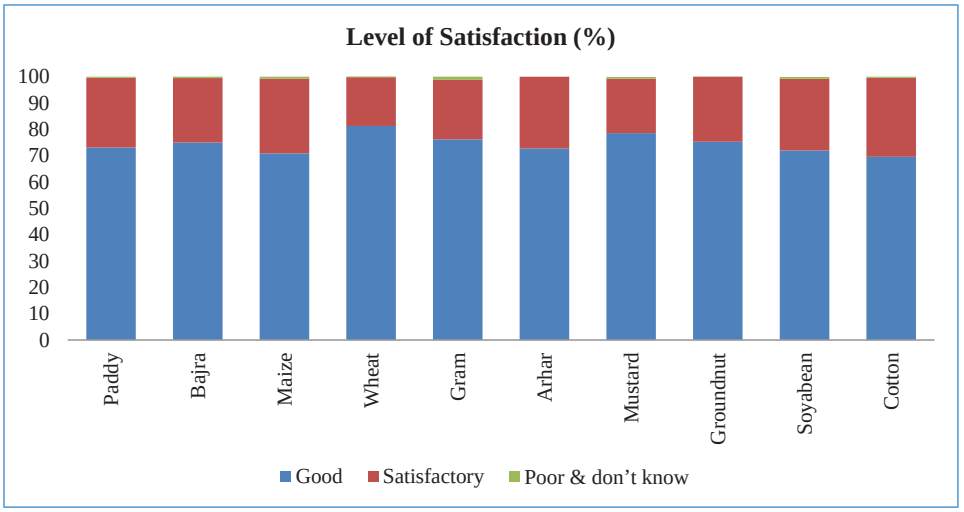
Seed is the most critical input in crop production, and its quality is vital for a good harvest. Figure 12 shows the distribution of households sourcing seeds from different agencies in 2018–19. In the case of paddy, maize, gram, pigeon pea, and groundnut, more than 20% of the households reported using own farm-saved seeds. Local market is the main source of seeds for most crops. Direct purchases through cooperatives and government agencies is not as prominent. APMC market, input dealers, FPOs, private processors, contract farming sponsors/companies, are other sources of seeds.

Figure 12. Distribution of agricultural households reporting use of seed by their agency of major procurement for selected crops, 2018-19



Information on seed quality is also equally important. Figure 13 shows the level of satisfaction of households with the quality of seeds. Between 70 to 80% households have reported quality of seed as good. The proportion of households reporting poor quality seed was less than one%.

Figure 13. Distribution of agricultural households for quality of purchased seed, 2018-19



5.2 Sources of other Inputs

The distribution of agricultural households reporting agencies of major inputs is shown in Table 13. More than 82% of households have reported the application of chemical fertilizers during the kharif season. In contrast, only 64.4% of them have reported using chemical fertilizers in the *Rabi* season. More than 40% of agricultural households have reported using plant protection chemicals, and around 10% bio-fertilizers and bio-pesticides. The local market is the prominent source for most of these farm inputs.

5.3 Quality of Farm Inputs

The level of satisfaction of agricultural households concerning the quality of farm inputs is depicted in Table 14. Between 66 to 81% of agricultural households have reported the quality of farm inputs as good. The proportion of households indicating the poor quality is less than one percent.

Table 13. Distribution of agricultural households across the agencies of input purchase

Type of material	% of crop-producing HHs using the resource	Percent distribution of procurement agencies			
		Local market	Coop. and Govt. agencies	Input dealer	Others
July–December 2018 (*Kharif* season)					
Chemical fertilizers	82.2	84.1	7.0	6.7	2.2
Bio-fertilizers	13.9	83.4	3.1	9.9	3.6
Manures	53.7	22.0	0.7	0.6	76.8
Plant protection material (Chemical)	48.4	87.5	2.0	8.4	2.1
Plant protection material (Biopesticides)	9.7	81.9	4.0	8.9	5.3
Irrigation	31.1	39.7	10.2	3.6	46.6
January-June 2019 (*Rabi* season)					
Chemical fertilizers	64.4	85.5	5.0	8.1	1.3
Bio-fertilizers	10.4	84.6	2.9	10.2	2.2
Manures	35.0	21.4	0.1	0.6	77.8
PP material (Chemical)	40.5	87.8	0.9	9.9	1.4
PP material (Bio-pesticides)	6.9	79.1	2.0	16.0	3.0
Irrigation	31.9	40.9	6.5	3.2	49.3

Table 14. Percentage distribution of agricultural households reporting use of different purchased inputs by their quality

Type of resource	Good		Satisfactory		Poor & don't know	
	Kharif	*Rabi*	*Kharif*	*Rabi*	*Kharif*	*Rabi*
Chemical Fertilizers	76.8	79.6	22.7	20.1	0.4	0.1
Bio-Fertilizers	71.0	77.7	28.5	22.0	0.1	0.0
Manures	66.6	65.8	31.2	30.8	0.7	0.5
Plant protection material (Chemicals)	77.7	77.6	21.8	22.1	0.3	0.1
Plant protection material (Bio-pesticides)	75.9	81.0	23.7	18.4	0.1	0.0
Irrigation	73.3	69.9	25.3	28.3	1.1	0.8

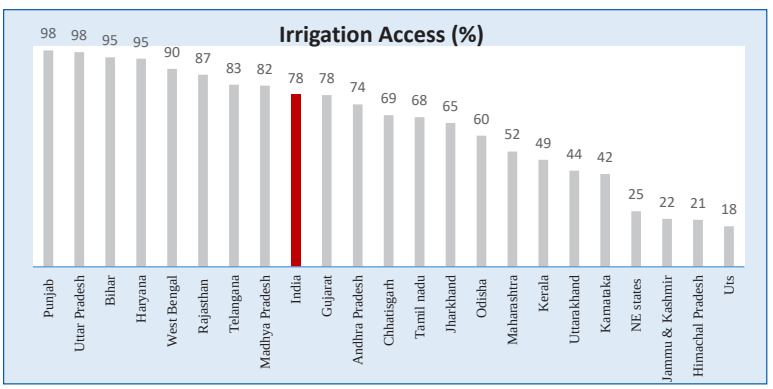
5.4 Irrigation

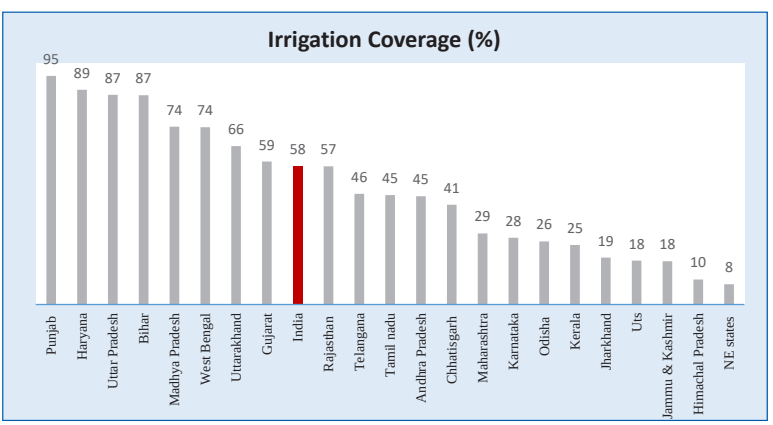
Irrigation is critical for a good harvest. Between 61-78% of agricultural households have access to irrigation in 2018-19 (Table 15). However, access to and coverage of irrigation is not uniform across states. Access to irrigation varies from 98% in Punjab and Uttar Pradesh to 21% in Himachal Pradesh (Figure 14). Groundwater has emerged as a major source of irrigation for 71-77% of the area in 2018-19 (Table 15).

Table 15. Status of irrigation coverage, 2018-19

Particulars	July-Dec, 2018	Jan-June, 2019
Access to irrigation (%)	61	78
Irrigation coverage (%)	47	58
Sources of irrigation (%)		
Canal	20	16
Minor surface (pond, tank, etc.)	4	4
Groundwater	71	77
Combination of three	1	1

Figure 14. State-wise access and coverage of irrigation in 2019 (Jan-June)





5.5 Access to Technical Information

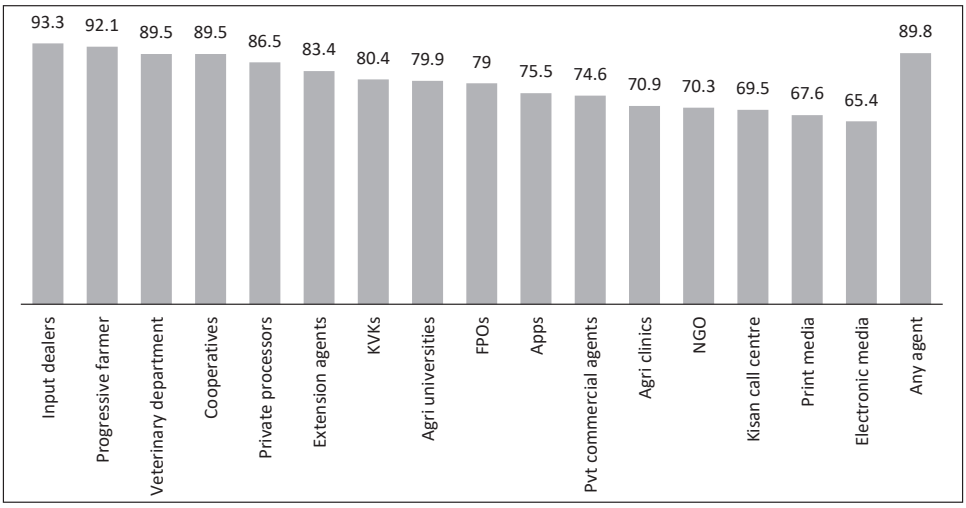
Households' access to modern technology and technical advice is essential for the adoption of technologies to realize better farm outcomes. Table 16 presents the distribution of agricultural households accessing technical advice from different sources. In 2012-13, 41% households accessed technical advice from different agencies/sources. This increased to 49% in 2018-19. Progressive farmers, input dealers, and electronic & print media remain the main sources of technical advice and information (Figure 15). Further, 65-94% of the households accessing information utilized it in their decision-making.

Table 16. Agricultural households accessing technical advice from different sources

Source/agencies	% Agricultural HHs reporting access	
	2012	2018
Progressive farmer	20.0	22.8
Input dealers	-	19.9
Electronic and print media	19.6	18.5
Veterinary department	8.0	6.6
Private commercial agents	7.4	1.2
Extension agents	6.2	3.1
KVKs	2.7	1.3
Agricultural university/ college	1.2	0.3
NGO	1.2	0.6
Cooperatives	-	2.7
Private processors	-	2.1
Kisan call center	-	1.5
Smartphone-based apps	-	1.2
Any agent	40.6	48.7

Source: Authors' computation

Figure 15. Agricultural households adopted the advice among those who accessed technical advice in July-December 2018 (%)



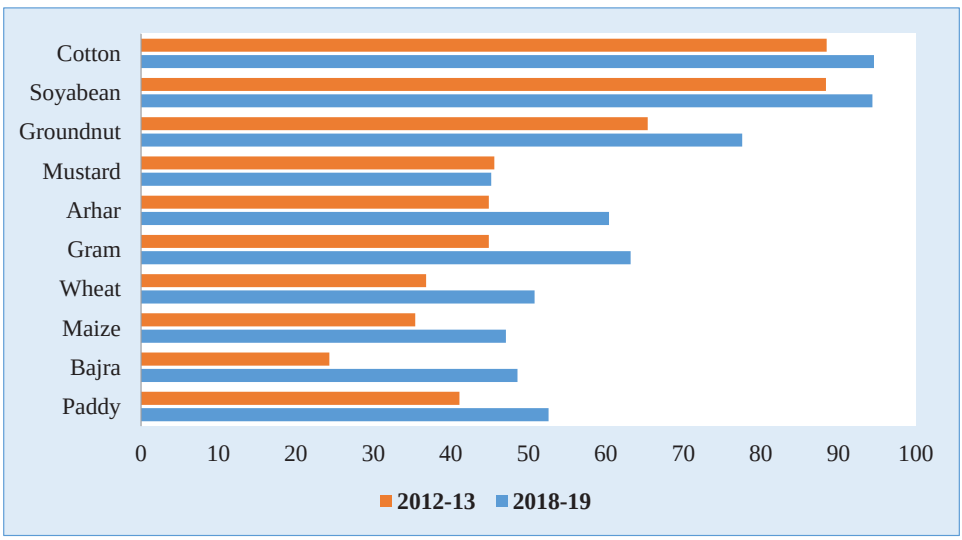
6 Produce Disposal Pattern

Most farm households sell their agricultural produce to local private traders or in mandis, whereas a small percentage of them sell it to cooperatives & other public agencies. Despite the improvement in awareness regarding MSP, only 21-40 percent of the agricultural households are aware of it. Wheat and paddy are the main crops sold to the procurement agencies at MSP.

6.1 Marketing Agencies

Figure 16 shows proportion of agricultural households reporting sale of produce in 2012–13 and 2018–19. About 40-50% of the agricultural households have reported the sale of produce to various agencies in 2012-13. Their proportion is higher in 2018-19, more significantly in the case of pigeon pea, gram and bajra.

Figure 16. Agricultural households reporting the sale of produce (%)



Depending on the marketable surplus, information of market price and access to markets, the produce is sold to different agents. Table 17 presents details of the quantity sold of selected crops in 2018-19. Between 55-83% of the farmers sell their produce in nearby markets, the maximum proportion of maize (83%) is sold in local markets. To APMC markets, it

varies between 7 to 22%, and to government agencies 0.8 to 22%. Farmers prefer selling in local markets. In the case of rice, farmers sell 63.4% of their produce in local markets, and nearly 30% of the overall sales was performed through APMC markets and governmental parastatals. In the case of wheat, farmers sold 66% of the marketable surplus in local markets and 29% to traders in APMC markets and government agencies. This is so because rice and wheat are procured by the government agencies at their pre-announced minimum support prices.

Table 17. Quantity of selected crops sold to different agencies, 2018-19 (%)

Crop	Local market	APMC market	Coop. & Govt. agency	Private processors	Others
Paddy	63.4	8.4	21.7	2.7	2.3
Bajra	82.4	10.1	3.8	1.8	1.3
Maize	83.3	6.7	3.0	3.2	0.3
Wheat	66.1	12.7	16.8	1.6	1.5
Gram	70.1	15.1	6.9	5.1	1.9
Arhar	68.0	22.1	1.8	6.8	0.8
Mustard	75.0	13.2	6.4	1.4	0.3
Groundnut	54.7	18.6	0.8	11.8	12.1
Soybean	63.1	21.6	7.7	7.0	0.1
Cotton	69.0	9.7	2.7	9.9	2.0

Source: Authors' computation

6.2 Awareness about MSP and Sales at MSP

Farmers' awareness of MSP is crucial for ensuring remunerative prices. Figure 17 depicts the proportion of households aware about MSP and selling produce at MSP. The proportion of households aware about MSP of different crops fluctuated between 5 to 39% in 2012–13, which increased to 21–40% in 2018–19.

Figure 18 presents the quantity of output sold at MSP. The proportion of wheat sold at MSP declined from 35% in 2012-13 to 21% in 2018-19; and of paddy from 27% in 2012–13 to 24% in 2018–19. Except wheat and paddy, only 2-13% of the marketable surplus of other crops (soybean, groundnut, pigeon pea, and gram) is sold at MSP.

Figure 17. Agricultural households having awareness about MSP

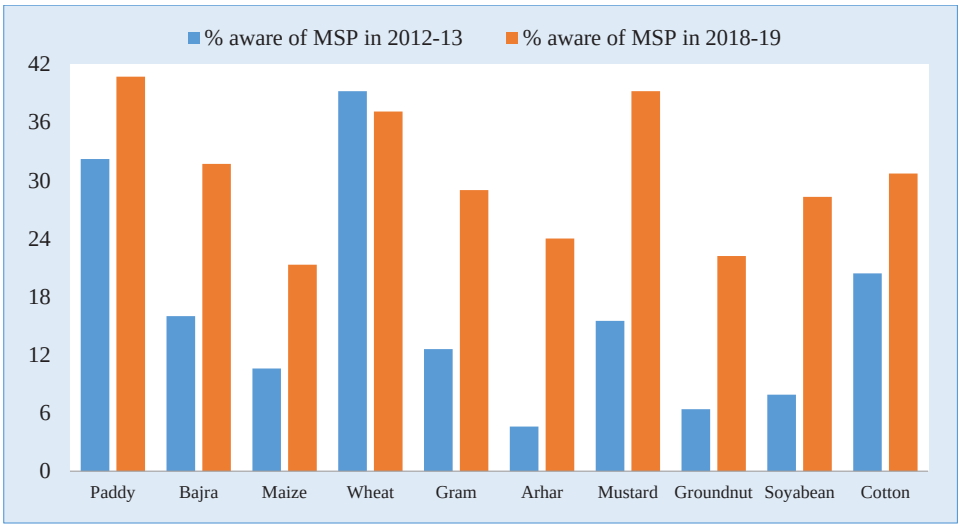


Figure 18. Percentage of output quantity sold at MSP

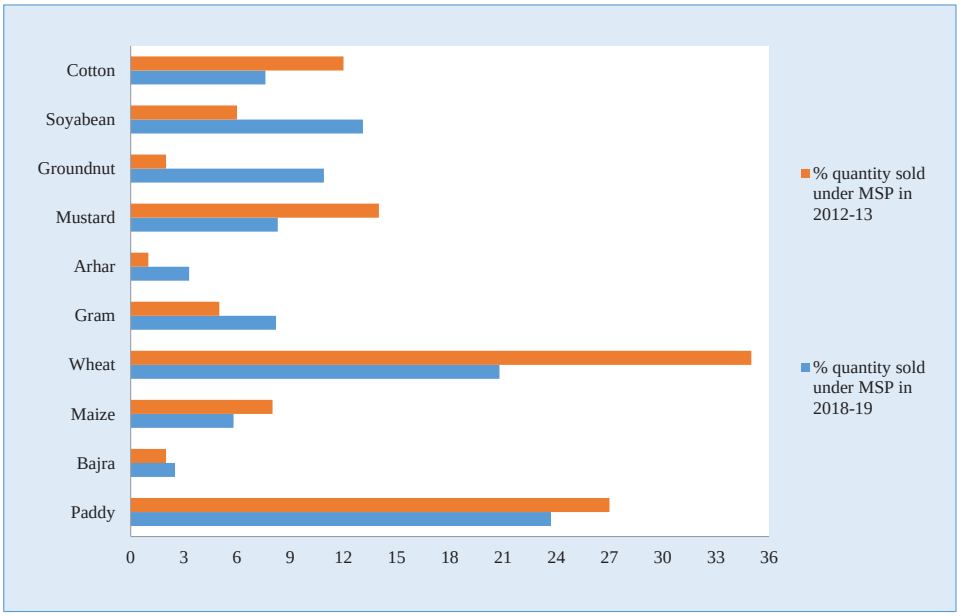
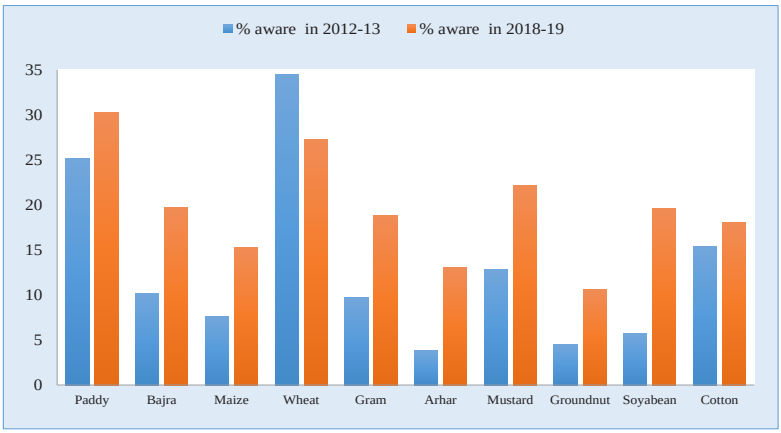


Figure 19 presents awareness of agricultural households about the procurement agencies. With the exception of wheat and paddy, less than 25% of agricultural households are aware of the procurement agencies. However, compared to that in 2012–13, the awareness of procurement agencies has significantly increased in 2018–19.

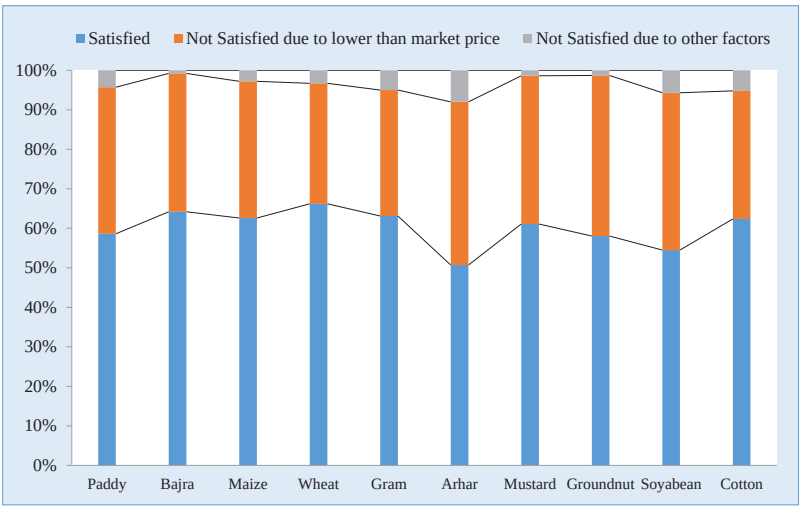
Figure 19. Awareness of the procurement agency among agricultural households (%)



6.3 Price Realization

How satisfied are the households with the sales of their crops? Their distribution by the level of satisfaction is shown in Figure 20. A majority of the households—50 to 65% have expressed satisfaction with crop sales. For instance, 59% of paddy farmers and 66.2% of wheat farmers are satisfied with the sales' outcome. However, the level of satisfaction in the case of pulses is less. Lower price realization is the major reason for farmers not being satisfied with their sale outcomes.

Figure 20. Distribution of agricultural households by the level of satisfaction of sale of selected crops, 2018-19



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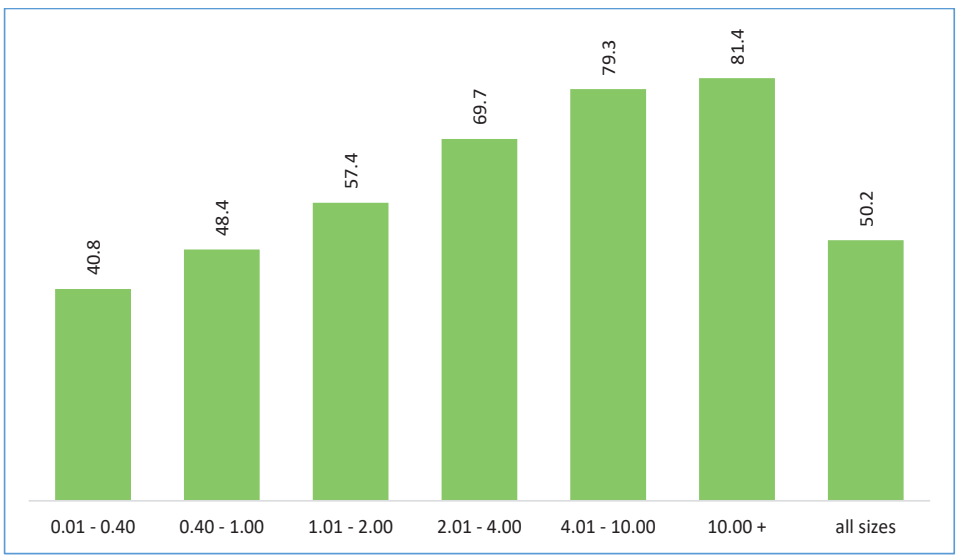
7 Agricultural Credit

There has been consistent rise in the households' indebtedness. The share of indebted households is higher in the large farm category. Their outstanding loan amount is approximately eight times that of small farmers. Further, the outstanding loan amount for large farmers has grown by more than 19% per year, the highest growth among all farm categories. Andhra Pradesh, Kerala, Punjab, Haryana, and Telangana are the major states which have higher investment levels. In contrast, north-eastern states, Jharkhand, Assam, and Chhattisgarh invest the least.

7.1 Purpose of Loan

The share of indebted agricultural households is roughly double in the large farm class compared to households with less than 0.4 hectares of land (Figure 21). In case of marginal landholders, the level of indebtedness is below the national average. It is more than 57% among smallholders and 70% among semi-medium landholders.

Figure 21. Share of indebted households, All-India (2018-19)



Source: SAS-LLH Survey (2018-19)

7.2 Amount Outstanding

Table 18 shows that there is a concurrent increase in the outstanding loans and a surge in the loan amount, along with an increase in indebtedness. This is confirmed for 2012–13 and 2018–19. In 2018–19, large farmers had outstanding loans that is much higher than that of marginal and small farmers. The outstanding loan has also grown significantly for large landholders; 19% per year between 2012-13 and 2018-19. For marginal farmers it is less than 3% and for small farmers about 7%.

The level of investment and the outstanding loan cannot be directly compared because the latter includes both short-term and long-term credit from formal sources including commercial banks, cooperatives, and regional rural banks, and also from informal sources like moneylenders, landlords, friends, and relatives. Still, one can expect the investment-credit correlation to be somewhat valid. For instance, States like Andhra Pradesh, Kerala, and Punjab have the highest outstanding loans (Figure 22) exceeding Rs. 2 lakhs. Haryana and Telangana are other major states with higher outstanding loans (Rs. 1.5-2.0 lakhs). These states have also the highest farm investment.

Table 18. Average credit outstanding of agricultural households (all India, 2012-13 to 2018-19)

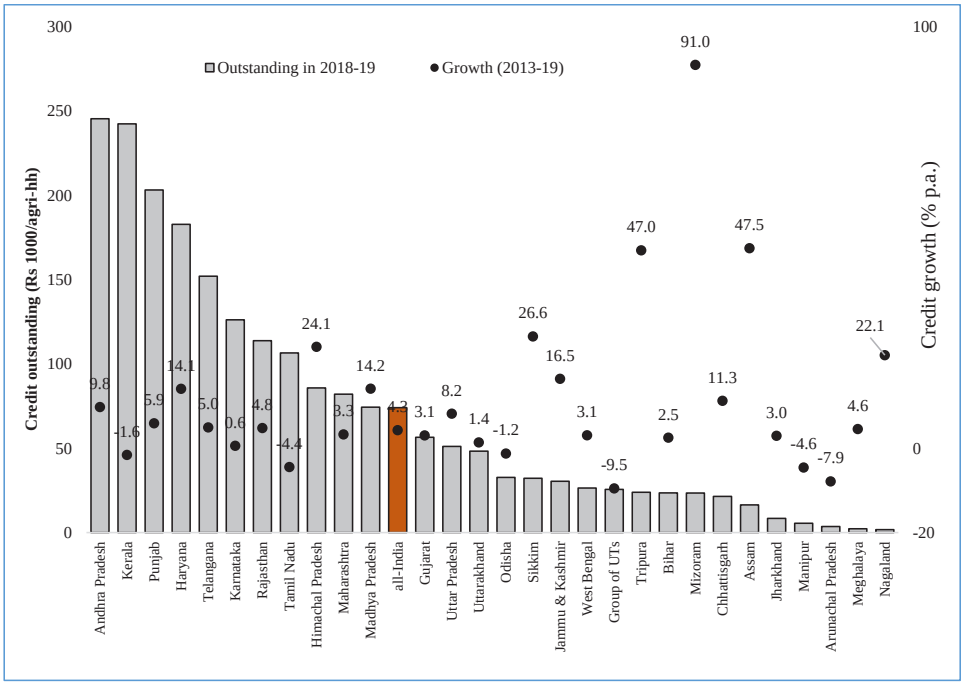
Land Class (ha)	Amount Outstanding (Rs/Agri HH)		
	2012-13	2018-19	Growth*(% p.a.)
0.01 – 0.40	23,900	33,220	1.8
0.41 – 1.00	35,400	51,933	2.8
1.01 – 2.00	54,800	94,498	6.3
2.01 – 4.00	94,900	175009	7.9
4.01 – 10.00	182,700	326766	7.1
> 10.00	290,300	791132	19.6
All	47,000	74,121	4.3

*Note: *in real terms (2011-12 prices, as in Table 6).*
Source: SAS-LLH Survey (2018-19)

This association between loan outstanding and investment also exists for states with lower access to credit. In Jharkhand, Nagaland, Meghalaya, Arunachal Pradesh, and Manipur, the outstanding loan are less than Rs. 10,000 per household. It is Rs. 16,000 in Assam and Rs. 20,000 to Rs. 30,000 in Chhattisgarh, Mizoram, Bihar, Tripura, and West Bengal. As noted earlier, Jharkhand has the lowest capital investments, followed by Assam,

Tripura, Sikkim, Nagaland, Manipur, Bihar, and Odisha. Regarding growth in credit between 2011-12 and 2018-19, there is a positive as well negative relationship between the outstanding loan and credit growth. The states having the highest outstanding loans, the growth in the outstanding loan is more than 10% in Haryana and 5% to 10% in Andhra Pradesh, Punjab, and Telangana. The growth is negative in Kerala, Tamil Nadu, and Odisha. The same holds true for Manipur and Arunachal Pradesh where access to credit is limited.

Figure 22. Credit outstanding and growth* across states (2012-13 to 2018-19)



Note: *growth is in real terms (2011-12 prices, as in Table 6)
Source: SAS-LLH Survey 2018-19

8 Institutional Initiatives and Government Schemes

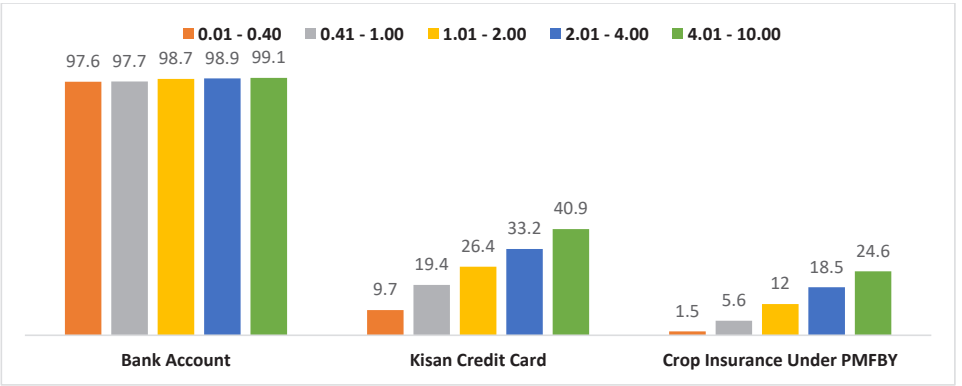
Almost all agricultural households have a bank account irrespective of their size of land holding. The probability of having a KCC increases, however, with the size of landholding. There is a positive association between participation and size of landholding.The percentage of households participating in PMFBY varied from 6% among marginal landholders to 25% among large farmers in 2018-19. Concomitantly, a tiny percentage of agricultural households are members of any registered farm organization. The participation in Soil Health Card Scheme and Animal Health Card Scheme also increases sharply with the size of land holding.

8.1 Access to Credit

Availability of credit from institutional sources, especially for small and marginal farmers is essential for improving agricultural credit (Dev, 2012). It is important to note that close to 98% of agricultural households have a bank account (Figure 23). The KCC scheme was introduced in 1998 as a credit transfer instrument to ensure timely access to institutional credit (Mani, 2016). KCCs are issued by commercial banks, regional rural banks, and cooperative banks. The probability of having a KCC increases with landholding size. Studies have also highlighted the positive impact of KCC on farm income (Prakash and Kumar, 2016). Farmers with a KCC usually have lesser dependence on moneylenders (Kumar et al., 2021).

Limited achievement is noticed in PMFBY, and it is supported by several studies (Ghosh, 2019; Kaur et al., 2021). The coverage is particularly dismal for marginal farmers; less than 6% of them have insured their crop under PMFBY. The percentage gradually increases with the size of landholdings. Studies have highlighted various issues faced in accessing PMFBY including lack of awareness, long delays in claim settlement, and complications in the process of evaluation of losses (Mukherjee and Pal 2017; Bhushan and Kumar 2017; Rai 2019).

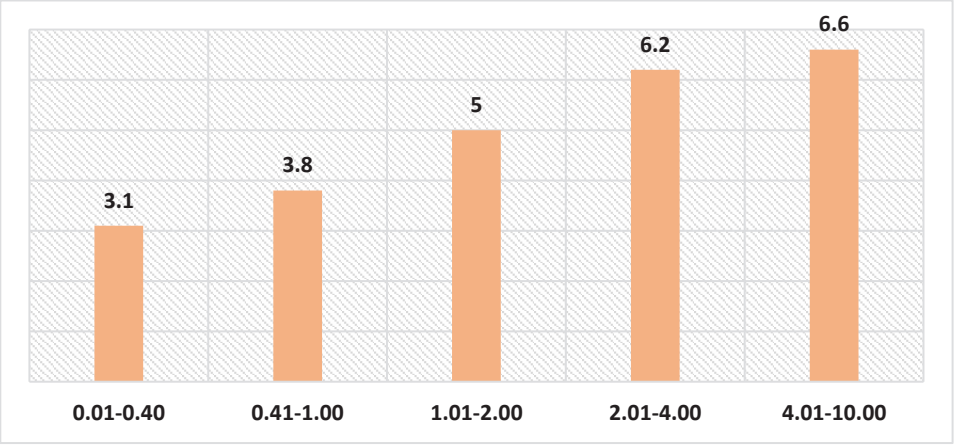
Figure 23. Agricultural households with access to finance facilities (%)



8.2 Membership in Organizations

A relatively smaller percentage of agricultural households are members of any registered organization, varying from 3.1% among households having land holdings between 0.01 and 0.4 hectare to 6.6% among households having landholding size between 4.01 to 10.0 hectares (Figure 24). Studies have indicated several benefits for agricultural households of their association with registered organizations. These include information on technologies and inputs, markets, and prices (Verma et al. 2019). Efforts are required to increase membership in such organizations to develop the capacity of agricultural households.

Figure 24. Agricultural households with membership in farmers' organization (%)

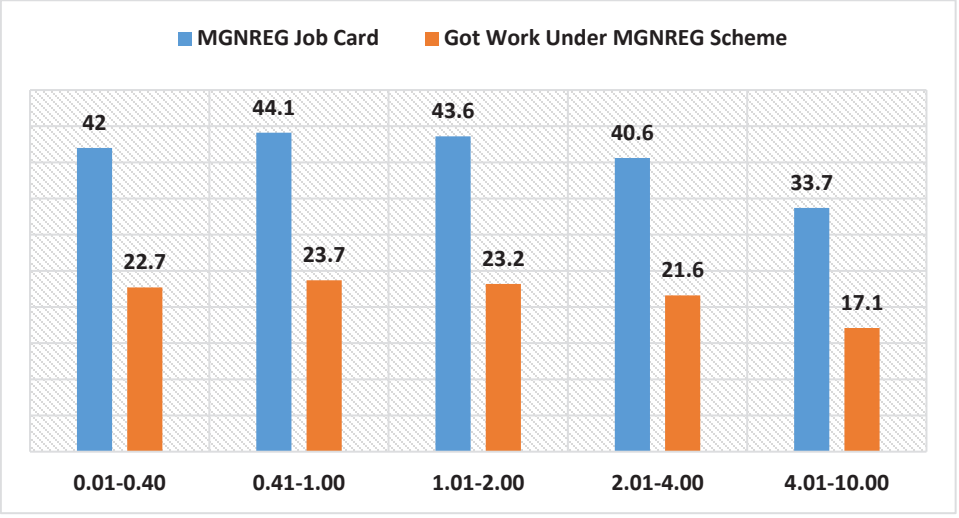


8.3 Participation in MGNREGS

As expected, the proportion of households possessing MGNREGS cards decreases with the increase in the size of landholding (Figure 25).

Since it is understood that persons with small land holdings must seek employment outside of agriculture, a similar trend is seen in work done under the MGNREG Scheme (Gulati et al., 2013).

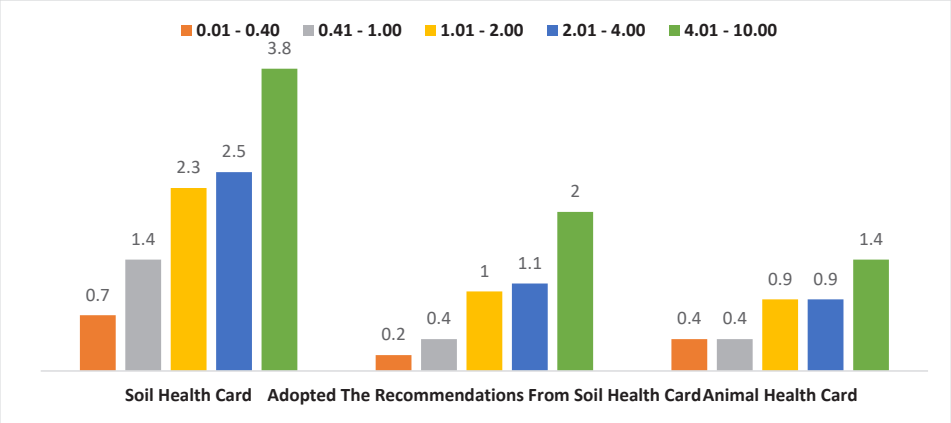
Figure 25. Agricultural households having MGNREGS card (%)



8.4 Access to Soil Health and Animal Health Card

To ensure soil health for sustainable agriculture, the Government of India introduced Soil Health Card (SHC) Scheme in 2015 with the objective of providing information to farmers regarding the soil nutrient status and accordingly advising them on the dosages of fertilizers and micronutrients. Despite the benefits of the SHC scheme (Reddy, 2017; Bordoloi and Das, 2017), the participation and the adoption of recommendations are considerably low, as seen in Figure 26. Landholdings are closely associated with the adoption of SHCs. The association is stronger in the case of the Animal Health Card Scheme.

Figure 26. Agricultural households with access to soil health card and animal health card (%)



9 Conclusions and Implications

Agriculture in India is dominated by smallholders. Close to 69% of the total landholdings are of size less than one hectare with an average size of 0.495 hectares. Landholdings are shrinking; their average size declined from 1.06 hectares in 2002-03 to 0.83 hectares in 2018-19. In 2018-19, about 9.31 crore rural households were engaged in agriculture and allied activities. However, there is a significant inter-state variation in the occupational structure.

The larger contribution of agricultural households and their pattern of investment has significant implications for productivity and income growth. Marginal and small landholders invest more in livestock and poultry because of their low initial capital requirement, and higher potential for income generation. On the other hand, larger farmers tend to invest more in the mechanization of farm operations probably because of their limited endowment of labor and also increasing agricultural wages.

Here is an important role of formal credit institutions. They should extend short-term and medium-term credit for investment in animal husbandry, and long-term credit to other farmers for the mechanization of agriculture. However, regional variation in credit access and investment is a major concern. The poor states should have a greater focus on agricultural credit policy.

The monthly household income has increased to Rs 10218 in 2018-19 from Rs 6426 in 2012-13 and Rs 2115 in 2002–03. In 2002-03, farm and non-farm sources had almost an equal share of household income. The share of farm income increased to 60% in 2012-13 but declined to 52% in 2018-19. The level and composition of income vary across land-holding classes. Furthermore, there is a significant variation in these across states. Farmers' income in Bihar, Uttar Pradesh, Madhya Pradesh, Telangana, West Bengal, and Chhattisgarh is less than the national average. Farmers of Jharkhand and Odisha have one of the lowest income levels, while those in Punjab and Haryana have more income than in other states.

Concomitantly, several leading agricultural states have reported a deceleration in income from crop production. Thus, policymakers must

acknowledge and maneuver to ensure a supportive environment for accelerating employment diversification within and outside agriculture. States with low levels of diversification must also concentrate on raising farm incomes. There exists ample scope to encourage an ecosystem, where non-farm economic activities can thrive, particularly in states where income from agriculture is limited.

Markets act as an incentive to enhance agricultural production. Markets however are underdeveloped. Farmers procure inputs and sell outputs mostly in local markets, except rice and wheat. Private processors are emerging as an export-oriented marketing channel for agricultural produce. Effective implementation of market reforms and price support is needed to enhance farmers' income.

Contrary to crops, income from animal husbandry has grown remarkably during 2012-13 to 2018-19. Thus, effective policy support is therefore essential to augment their role in farm household economies.

To improve farm income and nutritional security a conducive policy environment is warranted. In particular, for smallholders, non-farm activities need to be promoted. There is potential for rural industrialization as well, but it is important to ensure a thrust on labor-intensive agro-based enterprises. Further, a thriving rural non-farm sector is crucial for reducing the excessive employment pressure on agriculture. Financing agri-infrastructure and MSME will go a long way in fostering linkages between farm and rural non-farm sectors.

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Appendix

1. Trends in operational holdings of rural households

Particulars		2018-19	2012-13	2002-03
Number of operational holdings (million)		101.98	108.78	101.27
Average area operated per holding (ha)		0.83	0.87	1.06
Percentage of joint holdings (%)		4.4	2.6	0.4
Number of parcels per holding (no.)		3	2	2.3
Percentage of operational holdings with partly or wholly (%)	*Owned*	97.7	97.3	95.3
	Leased-in	17.3	13.7	9.9
In total area of operational holding, share of (%)	*Area owned*	85.6	87.8	92.7
	Area leased-in	13.0	11.3	6.5
	Area otherwise possessed	1.4	1.0	0.8

Data source: SAS-LLH Survey (2018-19)

2. Trend in the distribution of number and area of operational holdings of rural households

Farm size	Distribution of the number of operational holdings (%)				Distribution of area of operational holdings (%)			
	2018-19	2012-13	2002-03		2018-19	2012-13	2002-03	
			Kharif	Rabi			Kharif	Rabi
Landless (<0.002 ha)	-	-	-	-	-	-	-	-
Marginal (>=0.002 to 1 ha)	72.6	73.2	69.8	70	31.7	27.7	22.6	21.7
Small (1-2 ha)	16.4	15.3	16.2	15.9	24.7	23.4	20.9	20.3
Semi-medium (2-4 ha)	8	8.1	9	8.9	22	23.5	22.5	22.3
Medium (4-10 ha)	2.7	3	4.2	4.4	16.2	19.3	22.2	23.1
Large (>10 ha)	0.3	0.4	0.8	0.8	5.4	6	11.8	12.5
Overall	100	100	100	100	100	100	100	100

Data source: SAS-LLH Survey (2018-19)

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भाकृअनुप–राष्ट्रीय कृषि आर्थिकी एवम् नीति अनुसंधान संस्थान
ICAR - NATIONAL INSTITUTE OF AGRICULTURAL ECONOMICS AND POLICY RESEARCH
(Indian Council of Agricultural Research)
Dev Prakash Shastri Marg, Pusa, New Delhi - 110 012, INDIA
Ph: +91(11) 2584 7628, 2584 8731 Fax: +91 (11) 2594 2684
Email : director.niap@icar.gov.in, Website : www.niap.icar.gov.in