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TRENDS IN COSTS AND INCOMES FROM CROP PRODUCTION IN INDIA

ANALYSIS OF COSTS OF CULTIVATION DATA, 2000-01 TO 2019-20

REPORT PREPARED BY THE FOUNDATION FOR AGRARIAN STUDIES FOR INTERNATIONAL RICE RESEARCH INSTITUTE

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A Project Report prepared by the Foundation for Agrarian Studies for International Rice Research Institute

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Preface

The Foundation for Agrarian Studies (FAS) undertook a research project titled "Big Data Analysis to Understand Trends in Gender Division of Work and Wages in Rural India and Trends in Costs and Incomes from Crop Production in India" in collaboration with International Rice Research Institute (IRRI). The project consisted of two work packages. Work Package 1 sought to analyze the gender division of work in Indian agriculture, and its implications for gender wage gap. Work Package 2 is a detailed enquiry into the trends in costs, prices, incomes from crop production in India.

This Report is an outcome of the Work Package 2. It examines the component- and state-wise trends in costs of cultivation, prices, and incomes from 2000–01 to 2019–20 for 10 agricultural crops (i.e. paddy, maize, *urad*, gram, *arhar/tur*, rapeseed and mustard, groundnut, soybean, sunflower, and sesamum) in India.

A predominant share of the Indian workforce depends on agriculture and the incomes of agricultural households have been a concern in India. Growth in agricultural incomes have slowed down after the mid-1990s, with the recent decade seeing a decline in real farm incomes per household. The last few decades has been characterised by widespread distress among agricultural households. Given this context, pathways to enhance incomes of agricultural households, and measures to improve farm profitability in particular, have received wide attention in the policy space.

This Report provides detailed descriptions of the trends on profitability, incomes, costs, prices, yields, and input use over the last two decades for the 10 selected crops. In addition to offering

the broad trends, it also provides some directions for improving incomes from farm production. It uses the state-level reports released by the Comprehensive Scheme on Costs of Cultivation/Production of Principal Crops of India (CCPC Scheme). The long-term data from the CCPC Scheme were obtained from the website of the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers' Welfare, Government of India.

A few important findings of the Report are as follows. Profitability of all selected crops has declined in recent years. There are wide variations in profitability, yields, and real incomes across states, which have not been bridged in the last two decades. However, the variations in costs across states have reduced over time. In other words, the gap in costs between states have become narrower than gaps in incomes and yields. Various policy measures for prices, yields, and costs are required to reduce the regional imbalances and to improve overall incomes from agriculture. We hope that our detailed findings on these aspects of crop incomes will stimulate some helpful discussions for agricultural policy makers in India.

The research team comprised K. Deepak Johnson and Kulvinder Singh from FAS. The team conceptualised the flow of work, analysed the data, and drafted the Report. We are especially thankful to Madhura Swaminathan, Ashish Kamra, Kunal Munjal, Tapas Singh Modak, Arindam Das, Soham Bhattacharya, and Surjit Vikraman for providing several valuable comments during the various phases of this project. We thank Nilanjana Dey for copy-editing the various drafts of the report. Sethu C. A. from the Foundation prepared the design and layout of the Report. We are also grateful to Ranjitha Puskur and S. Niyati from IRRI for their comments and support throughout the project.

Sandipan Baksi
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1 Introduction

This Report examines the component- and state-wise trends in costs of cultivation, prices, and incomes from 2000–01 to 2019–20 for selected agricultural crops in India.

According to the National Sample Survey's Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India, 2019, around 69 per cent of agricultural households or an estimated 64 million households in India were classified as self-employed in crop production (Government of India, 2021a). As a predominant share of the workforce lives on agriculture, the incomes earned by agricultural households have been a concern in India. India has monitored the long-term changes in agricultural costs and prices through the Comprehensive Scheme on Costs of Cultivation/Production of Principal Crops of India (CCPC Scheme) from the 1970s. The initiation of the scheme followed the introduction of green revolution technologies that changed the farming system in India (Sen and Bhatia 2004). The relative changes in technology mix, with a shift away from traditional to modern inputs, were noted by scholars of agriculture in India. The resultant changes in incomes and costs of cultivation, influenced by the policy regime comprising price, credit, and other institutional support, have been studied using the data generated by the CCPC Scheme.

Along with improvements in yields for major crops, the studies from the 1980s and 1990s show that profitability of farming and agricultural incomes improved during this period. Losses from crop cultivation were limited to a few crops, mainly confined to certain coarse cereals, pulses, and oilseeds. The Farm Management Studies that preceded CCPC and pertained to a period prior to the green revolution (the 1950s and 1960s) had shown that losses from farming were widespread. The detailed study of agriculture through the CCPC scheme also fed into the system of fixing support prices for different crops (the minimum support price or MSP). Along with favourable incomes and costs, the growing public investment in agriculture during the 1970s and the 1980s contributed to an era of agricultural growth (Foundation for Agrarian Studies, 2022).

However, after a period of agricultural growth, economists and scholars have pointed to a slowdown in agricultural incomes after the mid-1990s (Bhalla and Singh 2012; Chand et al. 2015; Ramakumar 2022). The issue of farm productivity and profitability received much attention in the early 2000s. Persistent low incomes from agriculture were considered to have contributed to rural distress, characterised by a large number of farmer suicides and nearly one-fifth of agricultural households living below the poverty line (Chand 2017; Nagaraj et al. 2014). The National

Commission on Farmers, (2004), set up to investigate the issues in farming and recommend suggestions to improve the situation of farmers, in its report identified low profitability as a key factor to be addressed in improving incomes. Improvements in productivity comprised the key pathway to improving incomes.

The decline in agricultural incomes after the 1990s in India has been largely attributed to increasing costs and low prices realised by farmers (Kannan 2015; Raghavan 2008; Srivastava et al. 2017). The costs of inputs have increased after the government cut down subsidies significantly as part of neoliberal reforms (Raghavan, 2008). While there was a brief change in policies and a reversal in agricultural growth during the second half of the 2000s, the Committee on Doubling Farmers' Income, set up by the Government of India that examined various sub-sectors within agriculture, found that average incomes for major crops across many states had reduced in the 2010s (Deokar and Shetty 2014; Government of India 2017). The most recent data, based on large-scale household surveys, also showed a real fall in incomes from crop production in the 2010s (Narayanamoorthy and Sujitha 2021).

Crop incomes were discussed extensively in relation to the long-term changes in agricultural growth and the welfare of agricultural households in India. Along with the role of crop incomes, the specific methods of measurement of incomes and costs from crop production in India were also discussed extensively. These discussions were mainly around the methodological issues, the cost concepts to be used and various component costs to be considered, and the need to balance economic returns and ecological sustainability. Some aspects of the discussion — such as the changes in sampling strategy − have been considered in the implementation of the CCPC Scheme over various years. However, there are certain unresolved issues too (Surjit 2017).

Another aspect of the discussion around crop incomes has been the variations across different regions. The agriculturally advanced states of Punjab and Haryana have high crop incomes relative to other regions (Government of India 2017). Various studies have pointed to the disadvantaged position of small and marginal cultivators in relation to others, who often have losses from crop cultivation, low productivity, and limited access to the better prices offered by the public procurement system (Bakshi and Modak 2017; Das and Swaminathan 2017; Sarkar et al. 2014).

The literature also discusses the issues of ecological sustainability in this context. The cropping pattern based on rice and wheat systems has resulted in excessive groundwater use with some reported adverse effects on the environment. Various governments have advocated crop

diversification to reduce the adverse environmental impact and realignment of cropping patterns to suit the ecology in the past (Government of India 2021b). There has been increased focus on alternate crops and strategies that would maintain the standard of living of cultivating households in recent years, with oilseeds, pulses, and horticultural crops promoted as substitutes for rice- and wheat-based cropping systems.

Given the importance of crop incomes in this context, this research Report examines the recent trends in the incomes and costs of a few selected crops. The study is carried out at both the national level and selected states. While groups within cultivators face varying conditions, given the absence of data at the state level, we do not examine those changes in this Report. Particularly, the following questions are answered in this Report:

1. How has the profitability changed for the selected crops over time and across different states in the last two decades?
2. What are the trends in incomes and costs over time at all-India and specific state levels? Are there differences between different states in India?
3. What are the changes to the cost structures in crop cultivation?
4. How varied are the yields and use of input across the selected states?
5. What were the general levels of prices realised by farmers during the last two decades for the selected crops? Were they higher or lower than the Minimum Support Prices?

We examine a total of ten crops in this Report: two kinds of cereals (paddy and maize), three pulses (*tur*, gram, and *urad*), and five oilseeds (groundnut, rapeseed/mustard, soybean, sunflower, and sesamum). The rest of the Report is organised as follows. Section 2 deals with the methodologies used for the study. Section 3 onwards, is on each crop, with detailed analysis at all-India and state levels. The last section concludes, summarising some key insights for policy consideration from the study.

2 Methodology

2.1 Database

The database for the study is the state-level reports released under the CCPC Scheme by the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers' Welfare, Government of India. The data from the CCPC Scheme has been used by the Commission on Agricultural Costs and Prices (CACP) to arrive at the Minimum Support Prices (MSP) for 23 crops. The scheme currently covers 20 states. The state-wise estimates from the CCPC Scheme were released as publications entitled "Cost of Cultivation of Principal Crops in India" in 1990, 1996, and 2000 (Sen and Bhatia 2004). The estimates from 1996–97 are available on the website of the Directorate of Economics and Statistics.

Variables. The concepts and methodology used for estimating the costs and incomes are provided in the Manual on Cost of Cultivation Surveys (Government of India, 2008). The CCPC Scheme collects information on costs and aggregates them at different levels to arrive at various cost concepts. Broadly three cost concepts are used frequently in the literature. These are:

1. Cost A2, which includes all paid-out costs such as the physical inputs (seeds, fertilizers, manure, insecticides, etc), hired human labour, machine labour, animal labour, interest of working capital, rent paid for leased-in land, and depreciation and maintenance expenditure incurred for own machinery and other fixed assets;
2. Cost A2 + FL, which includes Cost A2 and the imputed value of Family Labour (FL) used for cultivation; and
3. Cost C2, which includes all the previous cost components, and the imputed value of own land used for cultivation and other fixed assets utilised for cultivation.

The incomes from crop cultivation are derived as the difference between the gross value of output (GVO) and any of the above cost concepts. The GVO is calculated as the sum of the main product and the by-product, where the main product is the total production *multiplied by* the price realised by the farmer. The income concepts corresponding to Cost A2 are generally termed the farm business income (FBI) and those associated with Costs A2+FL and C2 are termed net income (NI1 and NI2).

There are different views about which of these costs or income concepts should be considered the most appropriate costs and incomes from farming, including the recent debate on what costs should form the basis for the MSP (Chand 2018; Damodaran 2018; Dev and Rao 2010; Ramakumar 2018; Sen and Bhatia 2004). In 2018−19, the CACP started recommending the MSP at the level of one and half times the Cost A2+FL for all crops. Given the prominence of the above three cost concepts, this study uses them along with the corresponding income concepts for analysis.

In addition to the variables on costs and incomes, the CCPC Scheme also provides information on input use, prices realised by farmers, and yields of crops. Apart from the cost concepts mentioned above, CCPC Scheme provides data on two other heads of costs - operational and fixed costs. The operational costs are costs incurred for human labour, animal labour, machine labour, seed, fertilizer and manure, insecticides, irrigation charges, interest on working capital, and miscellaneous costs. Fixed costs comprise the rental value of owned land, rent paid for leased-in-land, land revenue, taxes, cesses, depreciation on implements and farm building, and interest on fixed capital. We also use the information provided on these items in this Report.

Issues. While we use the data generated from the CCPC Scheme, there are several issues with the reported data. Some of these, such as the underestimation of costs, large variations in yields reported by the CCPC Scheme and the official estimates, methodological issues and serious shortcomings in the imputation of land rent, and interests on the working capital and fixed capital, are documented in Sen and Bhatia (2004) and Surjit (2017). The underestimation of costs has been attributed to both conceptual and sampling issues. The CCPC Scheme's yield estimates have been higher than the official yields, and both series have diverged considerably in the 1980s and the 1990s. The interest rate for fixed capital has remained at 10 per cent and for working capital at 12.5 per cent, without taking into account the actual prevailing interest rates and the non-institutional credit system which charges much higher interest rates from the farmers. However, we are not dealing with these issues in this Report.

In addition to the above issues, we would like to highlight a few aspects related to the datasets used in this Report. First, there is a mismatch between state-level estimates and the estimates from the plot-level summary data published by the CCPC Scheme (Kamra 2022). Owing to our use of state-level estimates, we have not tried to reconcile the state-level estimates with the plot-level data. Secondly, the component costs did not add up to the total costs in some cases. We revised the

total costs in these instances. Thirdly, there were several issues related to seed costs. In a few cases, such as Punjab and Haryana in recent years, the seed cost for paddy was given as zero. Similarly, there were outliers in the case of sunflower (for input use). We used input use (that is quantity of seed used), cost of seed per kg, and total seed cost in conjunction to resolve such discrepancies. The values were retained as they were for instances that we could not resolve using this method.

2.2 Coverage of States

The CCPC Scheme selects crops and identifies the states to be studied in relation to each crop every three years. That is, once a crop and states for that crop are selected, they are fixed for a period of three years. The sample selection of cultivator households (operational holdings) in each state is carried out using the information within the state (at the level of agro-ecological zones, tehsils, and villages). The sample households also remain the same during a three-year period. The CACP uses the state-wise estimates to arrive at the all-India average, by weighting the state estimates. Area shares are used as weights. Estimates of variables at the levels of states and all-India were considered for this study.

However, given that states selected for each crop can vary every three years, this study uses the States for which estimates are available over 20 years. If there are more than five states for a crop given the above consideration, the top five major-cultivating states (based on average area) were selected. The average area during the last five years, that is 2015−16 to 2019–20, was taken for this purpose. If there were only four states, then the top three states were selected. The only exception was Tamil Nadu for paddy (rice), which was added to the list of states given its importance in rice production. The list of selected states is given in Table 2.1.

Table 2.1 *Selected States for Analysis*

Sl. no.	Crops	No. of states for which data are available for all years	Selected states and five-year average area (in '000 hectares)
1	Paddy (Rice)	12	1. Uttar Pradesh (5,831) 2. West Bengal (5,428) 3. Andhra Pradesh (3,913) * 4. Odisha (3,873) 5. Punjab (2,992) 6. Tamil Nadu (1,774)
2	Maize	7	1. Karnataka (1,332) 2. Madhya Pradesh (1,281) 3. Rajasthan (879) 4. Uttar Pradesh (726) 5. Bihar (689)
3	*Tur*	7	1. Maharashtra (1,274) 2. Karnataka (1,157) 3. Madhya Pradesh (476) 4. Uttar Pradesh (284) 5. Andhra Pradesh (268)
4	Gram	4	1. Madhya Pradesh (2,972) 2. Rajasthan (1,624) 3. Uttar Pradesh (505)
5	*Urad*	5	1. Uttar Pradesh (601) 2. Tamil Nadu (420) 3. Andhra Pradesh (396) 4. Maharashtra (336) 5. Odisha (75)
6	Groundnut	5	1. Gujarat (1,627) 2. Andhra Pradesh (926) * 3. Karnataka (564) 4. Tamil Nadu (328) 5. Maharashtra (298)
7	Rapeseed/Mustard	7	1. Rajasthan (2,551) 2. Uttar Pradesh (695) 3. Madhya Pradesh (691) 4. Haryana (563) 5. West Bengal (550)
8	Soybean	3	1. Madhya Pradesh (5,586) 2. Maharashtra (3,887) 3. Rajasthan (1,039)
9	Sunflower	1	1. Karnataka (198)

10	Sesamum	3	1. Rajasthan (282) 2. Gujarat (140) 3. Odisha (16)

Note: * indicates the combined average of Andhra Pradesh and Telangana.

2.3 Methods of Analysis

Indicators. The variables available from the CCPC Scheme are examined carefully as part of this research study. In addition to the variables on costs and incomes (Cost A2, A2+FL, and C2; FBI, NI1, and NI2), two ratios are used as indicators to study the returns from farming and the structure of costs. These are (1) profitability and (2) cost share, defined as the following:

$$Profitability = \frac{Gross\ Value\ of\ Output\ (GVO)}{Cost\ of\ Cultivation}$$

Profitability is calculated by taking the GVO and costs at current prices. There are three measures of profitability, corresponding to the three cost concepts taken into consideration. The higher the ratio, the greater the returns from farming. The all-India average profitability is calculated as the weighted average of state-level profitability ratios.

$$Cost\ share = \frac{Cost\ of\ cultivation\ of\ component}{Cost\ of\ Cultivation}$$

In other words, the cost share for a particular component is the share of that component in the costs of cultivation. A higher cost share for a component indicates its importance in the cost structure. And changes in cost shares indicate the changes in cost structure, with the relative importance of a component going up (down) with a larger (smaller) share in costs.

Both the ratios are expressed in percentage terms (that is they are multiplied by 100).

While examining prices realised by farmers (as reported by the CCPC Scheme), we have also used the MSP declared by the Government of India as a benchmark.

Sub-periods and Averages. The study takes up the period 2000–01 to 2019–20 for detailed analysis. Given that the CCPC Scheme conducts its study for three-year periods, this research study also takes these periods into account. In addition to the annual values, three-year averages

corresponding to the CCPC Scheme periods are also used for the analysis. The seven periods thus identified are as follows:

1. 2000–01 to 2001−02 * (the CCPC Scheme's three-year period is 1999−2000 to 2001−02; however, since this study starts from 2000–01, the period under consideration only has two years)
2. 2002−03 to 2004−05
3. 2005−06 to 2007–08
4. 2008−09 to 2010−11
5. 2011−12 to 2013−14
6. 2014−15 to 2016−17
7. 2017−18 to 2019–20

Choice of Deflators. The variables are reported in current prices in state-level reports released by the CCPC Scheme. Along with the values in current prices, real values (that is deflated values or values in constant prices) are also used in this study. The choice of deflator has also been discussed extensively in literature and different types of deflators are used in literature. Broadly, three methods of deflation are used:

1. Wholesale price indices (WPI) for outputs and respective inputs along with the consumer price index for agricultural labour (CPI-AL) for human labour. This is employed by the Committee on Doubling Farmers' Income (Government of India 2017) and by Kannan (2015).
2. The state-specific CPI-AL series for deflating both costs and incomes. This is used by Sen and Bhatia (2004; Chapter 6) to compare the costs and incomes across years and regions.
3. Deflators using Gross (State) Domestic Product (GDP/GSDP) from agriculture. This is employed by Surjit, (2008) and Kamra, (2022).

This study uses the state-specific CPI-AL for analysis. However, in order to see how values differ across different deflators, we plotted indices of WPI for Primary Articles (primary articles include food commodities), CPI-AL, and GDP deflator with base 2000–01 in Figure 2.1 and real farm business income (FBI) from paddy at an all-India level in Figure 2.2. These figures indicate that all three indices moved in the same direction during the study period. The variations in the CPI-AL index were between the variations in WPI for Primary Articles and GDP deflator in most years.

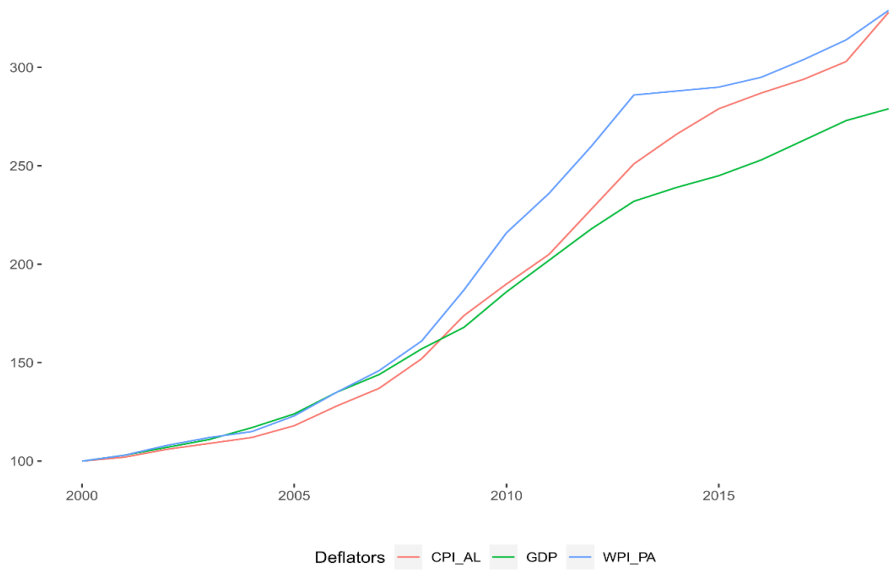
This implies that in most cases the real values deflated by CPI-AL would lie between the real values deflated by WPI for Primary Articles and GDP the deflator.

The real values are reported in 2000–01 prices in this Report.

Tools for Analysis. This study uses graphs and tables to summarise data and infer findings. We used MS Excel for preparing the datasets, R for transforming the datasets and plotting analytical graphs, and Microsoft PowerBI for the visualisation of raw data.

Sections for Crops. Each crop is analysed in subsequent chapters. The crop-specific discussion is arranged in the following order: profitability, incomes, and costs; cost components and prices; and yields and input use.

Figure 2.1 *Comparison between different deflators for analysis, 2000–01 to 2019–20 (base 2000–01=100)*



Note: CPI_AL refers to Consumer Price Index for Agricultural Labourers and WPI_PA refers to the Wholesale Price Index of Primary Articles.

Figure 2.2 Real farm business incomes from paddy, all-India, 2000–01 to 2019–20 in Rs per hectare (in 2000–01 prices)

Note: CPI_AL refers to Consumer Price Index for Agricultural Labourers and WPI_PA refers to the Wholesale Price Index of Primary Articles.

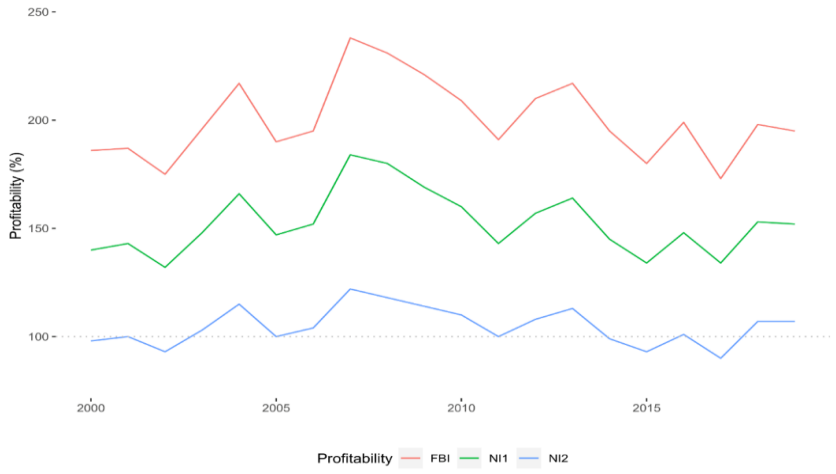
3 Paddy

The CCPC scheme covers the largest number of states for studying paddy — 19 states in the most recent cycle (2017–20). It is also one of the most cultivated crops, with about 53 per cent of households reporting cultivation in the kharif season and 9 per cent of households reporting cultivation in the rabi season during 2018–19 according to the Situation Assessment Survey (SAS) (Government of India 2021a). The gross cropped area under paddy was 22.4 per cent of the total cropped area during 2018–19 (Government of India 2022).

3.1 Profitability, Incomes, and Costs

The profitability, expressed as the ratio of the gross value of output to Cost A2, increased from 187 per cent in 2000–02 (three-year average) to 220 per cent in 2008–11 at the all-India level (Figure 3.1). It peaked in the year 2007–08 (238 per cent). The three-year average profitability at Cost A2 has reduced from the peak in 2011–14 to 189 per cent in 2017–20, a decline of 31 percentage points. Profitability at Costs A2+FL and C2 also show a similar trend. The profitability at A2+FL averaged 152 per cent during the study period. The average profitability at Cost C2 shows that there have been losses from paddy cultivation in certain years. Average profitability at Cost C2 for the period 2000–02 and 2014–17 was below 100 per cent, indicating losses from cultivation at the all-India level.

Figure 3.1 *Profitability at Costs A2, A2+FL, and C2 for paddy, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

While profitability indicates the margin of profit over costs, it is also important to see the absolute levels of profit per hectare. The average real farm business income (FBI), that is profit over Cost

A2, was Rs 9,853 in 2000–02 and increased to Rs 11,090 per hectare in 2017–20 for all of India (Table 3.1). Much like profitability at Cost A2, it peaked in the late 2000s, that is 2008–11. The FBI has declined since 2011-14. However, the recent period (2017–20) has seen a marginally higher FBI compared to the previous three-year period. In terms of growth rates, the FBI increased at a rate of 6 per cent, 13 per cent, and 21 per cent from the period 2000–02 to 2002–05, 2002–05 to 2005–08, and 2005–08 to 2008–11 respectively. There were negative rates after this, -6 per cent for 2008–11 to 2011–14 and -10 per cent for 2011–14 to 2014–17. The income at Cost A2+FL also followed a similar trend. At Cost C2, the three-year average net income 2 (NI2) for 2014–17 was negative (Rs -253 per hectare) - the lowest among the three-year periods under consideration.

Table 3.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for paddy, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	18,370	9,853	12,825	18,239	8,517	5,545	131
2002–05	19,738	10,669	13,826	19,652	9,069	5,912	86
2005–08	19,970	9,738	12,412	18,179	10,232	7,558	1,791
2008–11	22,838	10,495	13,420	19,745	12,343	9,418	3,093
2011–14	22,588	10,985	14,559	20,766	11,604	8,029	1,823
2014–17	21,976	11,527	15,627	22,229	10,449	6,349	-253
2017–20	23,107	12,017	15,438	21,706	11,090	7,669	1,401

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The Costs A2, A2+FL, and C2 have seen an increase at constant prices at the all-India level. Cost A2 was the highest in 2019–20 at Rs 12,697 per hectare. If three-year averages are taken, Cost A2 has shown a negative growth rate during 2005–08 where it declined by almost 10 per cent from the previous period. It has been increasing at an average growth rate of 5 per cent across the subsequent three-year periods. The operational costs of cultivation consisted of almost 67 per cent of the total costs (operational *plus* fixed costs). This has broadly remained the same across the study period.

The all-India profitability, incomes, and costs represent one side of the story. The other side is represented by the state-level analysis. The CV (coefficient of variation) for the measures of income across the states shows an increased variation over time, especially after 2013 (Figure A-

1). The variations in profitability at Cost A2 (or FBI Profitability as given in Figure A-1) have slightly reduced in recent years. However, such a trend is not visible for profitability at Costs A2+FL and C2, which have seen increased variation in recent years. In terms of yields, the variation across states has reduced. Similarly, the variation in costs has also reduced in the last decade. This implies that while the costs and yields were increasing and converging across the states, these have not resulted in any reduction in the variation of income measures across the states.

Broadly two groups of states can be seen when state-specific incomes are compared with an all-India average. Punjab, Andhra Pradesh, and Tamil Nadu constitute the group of states with higher-than-average all-India income (FBI, NI1, or NI2). Uttar Pradesh, West Bengal, and Odisha have lower than the average all-India income. However, there are variations in terms of other variables (such as profitability and costs) within these groups.

The profitability of paddy at Cost A2 was the highest for the state of Punjab. It averaged 276 per cent (ranging from 193 per cent to 345 per cent) from 2000–01 to 2019–20. For the state of Punjab, paddy has been a profitable crop even at Cost C2, the profitability at Cost C2 averaged 140 per cent across the years. Punjab also has the highest and lowest costs. The average FBI for Punjab is Rs 23,014 per hectare from 2000–01 to 2019–20. The three-year average Cost A2 for Punjab has remained between Rs 12,000 and 13,000 per hectare except for the periods 2002–05 and 2008–11. The cost structure however has changed during this period — the share of operational costs has gone below 50 per cent of the total after 2005-06 and the fixed costs accounted for more than 50 per cent of the total cost.

Even though Tamil Nadu has a higher than all-India average income, it had the lowest profitability at Cost A2 for paddy with an average of 167 per cent (ranging from 143 to 194 per cent) from 2000–01 to 2019–20. The three-year average GVO and Cost A2 have declined at the rate of 17 and 14 per cent respectively from 2011–14 to 2014–17. It further reduced by 9 and 8 per cent from 2014–17 to 2017–20. Even though the cost was reduced, a steeper reduction in GVO has affected the profitability of paddy in Tamil Nadu in recent years. The average FBI for 2000–01 to 2019–20 was Rs 11,081 per hectare.

The average FBI for Andhra Pradesh was Rs 15,718 per hectare from 2000–01 to 2019–20. The average profitability at Cost A2 was 203 per cent and ranged between 177 and 228 per cent. The

three-year averages show that the FBI reduced at an average rate of 5 per cent between 2011–14 to 2017–20. Cost A2, after reducing at a rate of 6 per cent between 2011–14 to 2014–17, increased by 16 per cent from 2014–17 to 2017–20.

In terms of income, Odisha has the lowest FBI at constant prices — Rs 8,161 — almost one-third of the FBI in Punjab. The GVO was also lowest in Odisha — an average of Rs 17,749 per hectare from 2000–01 to 2019–20. Though the costs were low, compared to many other states, the real FBI remained the lowest if all the years are considered. However, the increase in FBI has been the highest from 2014–17 to 2017–20, where it increased by 37 per cent (from Rs 7,768 to Rs 10,615 per hectare). The profitability at Cost A2 for Odisha (184 per cent from 2000–01 to 2019–20) was higher than West Bengal (171 per cent) and Tamil Nadu (167 per cent), whereas the average FBI was lower than these two states.

The states with the largest shares of area and production — Uttar Pradesh and West Bengal — had incomes lower than the all-India average. The average FBI for the 20-year period for Uttar Pradesh was Rs 9,662 per hectare. It was Rs 8,743 for West Bengal. The three-year average Cost A2 has increased in Uttar Pradesh at the rate of about 12 —15 per cent from 2008–11 to 2017–20. While in West Bengal, it increased by 12 per cent between 2008–11 to 2014–17 and reduced by 1 per cent from 2014–17 to 2017–20. Uttar Pradesh, West Bengal, and Odisha are the states with low absolute incomes from paddy cultivation.

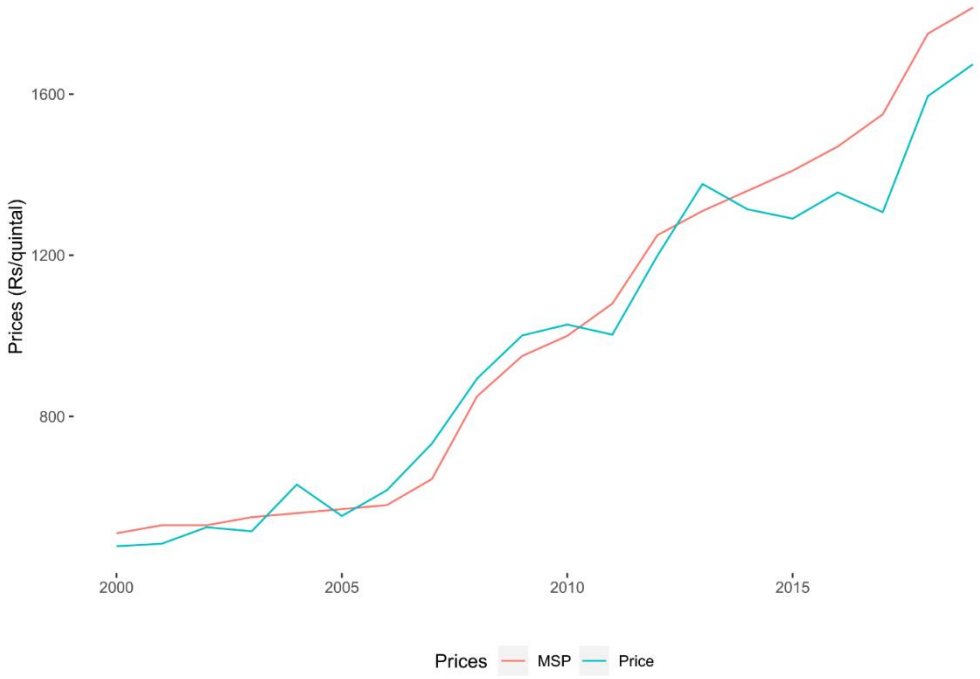
3.2 Cost Components and Prices

Human labour has remained a major cost factor contributing an average of 34 per cent of Cost A2 at the all-India level between 2000–01 to 2019–20. Across the three-year periods, the share of attached labour has reduced from around 2 per cent in 2000–02 to 0.6 per cent in 2017–20 and the share of casual labour has increased from 32 to 33 per cent. However, the share of casual labour has been reducing in the last decade: it reached a peak value of 35 per cent in 2011–14. The other important component of Cost A2 — fertilizer cost — decreased marginally from 13 per cent in 2000–02 to 12 per cent in 2017–20. Seed cost has also declined marginally. The largest decline has been for animal labour cost, which reduced from 12 per cent of Cost A2 in 2000–02 to 6 per cent in 2017–20. This decline in cost components has been balanced by an increase in machine labour cost, which has gone up from 10 per cent in 2000–02 to 20 per cent in 2017–20. Human labour as a share of Cost A2+FL constitutes around 50 per cent across years, with the share of imputed family labour cost being 23 per cent.

West Bengal had the highest human labour cost among all the states. The average human labour cost for West Bengal was Rs 10,626 per hectare from 2000–01 to 2019–20. This was about 41 per cent of Cost A2. Tamil Nadu had the second highest human labour cost, Rs 8,535 per hectare and 34 per cent of Cost A2. The lowest was in Punjab - Rs 4,859 per hectare and 23 per cent of Cost A2. While the animal labour costs reduced across all the states, it was highest for Odisha over the three-year periods with an average cost of Rs 1,566 per hectare. Machine labour cost was highest for Tamil Nadu at Rs 3,173 per hectare and lowest for Odisha at Rs 693 per hectare. Among the other components, irrigation costs were highest for Punjab (average of Rs 1,462 per hectare and 10 per cent of Cost A2). The insecticide costs varied across states — it was the highest in Punjab with Rs 1,294 per hectare and 12 per cent of Cost A2 and lowest in Odisha with Rs 116 per hectare and just 1 per cent of Cost A2.

In terms of prices, the MSP announced by the Government of India was higher than the prices realised by farmers for most of the years (Figure 3.2). The exceptions have been from 2002–05 to 2008–11, where the three-year average prices were higher than the MSP. Partly owing to the change in the methodology of calculating the MSP, the gap between the prices realised and the MSP has widened in recent years. The average for 2017–20 was Rs 1,705 per quintal for MSP and Rs 1,525 per quintal for prices realised (current prices). The gap between them was Rs 200 per quintal, which was below Rs 100 for all the other three-year periods. Real prices realised by farmers (at constant prices) peaked at Rs 568 per quintal during 2008–11 and declined to Rs 477 per quintal during 2014–17. It increased marginally to Rs 494 per quintal in 2017–20.

Table 3.2 *Prices realised by farmers (implicit rate) and MSP for paddy, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

Average prices for paddy in Punjab have been higher than the MSP for all the years, partly owing to the better procurement system and premium prices for export varieties (Basmati) of rice. The average prices realised by farmers were lower than the all-India average for Odisha, Uttar Pradesh, and West Bengal (average ranging between Rs 841 and 942 per quintal in current prices). The gap between MSP and prices realised by farmers was highest for Odisha, even with increased procurement in recent decades, with the difference being about Rs 149 per quintal. For 2017–20, the average gap was Rs 354 per quintal in Odisha.

3.3 Yields and Input Use

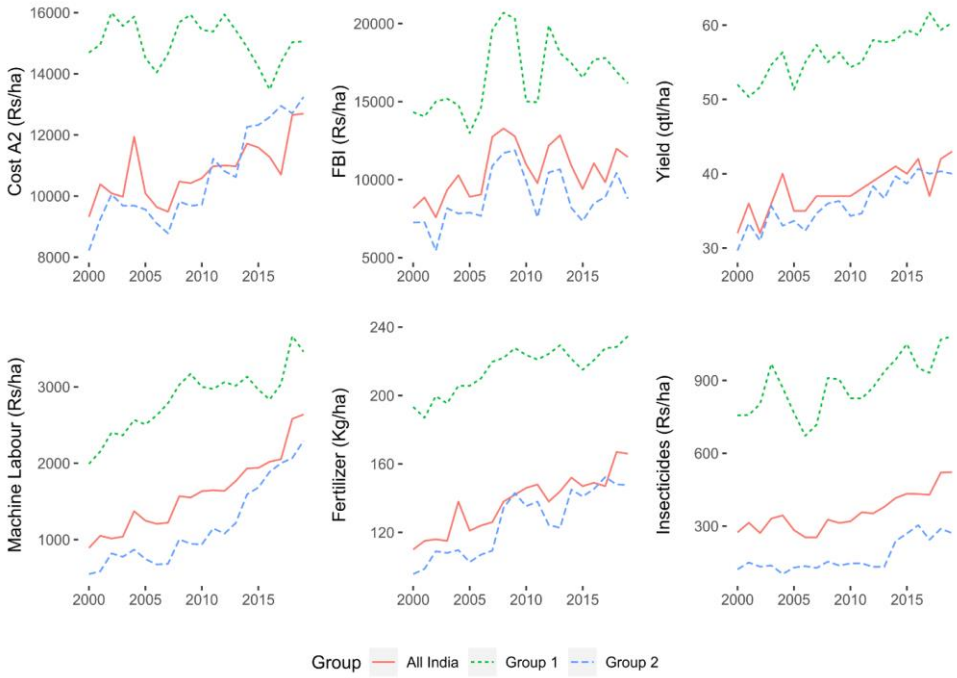
Paddy yields have increased across India. The average yield has increased from 34 quintals per hectare in the period 2000–02 to 41 quintals per hectare in the period 2017–20 according to the CCPC Scheme. Data from the crop production statistics, based on a different methodology of estimating yields, show that yields increased from 28 quintals per hectare in 2000–01 to 41 quintals per hectare in 2019–20. This increase in yield is despite the reduction in the seed use per hectare which has decreased from 54 kg per hectare in 2000–02 to 44 kg per hectare in 2017–20. The use of fertilizer has shown a substantial increase from 113 kg per hectare in 2000–02 to 160 kg per hectare in 2017–20. On the other hand, labour use — both human labour and animal labour —

has decreased across periods. Human labour use has decreased from 912 hours per hectare in 2000–02 to 620 hours per hectare in 2017–20. Animal labour use has also declined across periods from 96 hours per hectare in 2000–02 to 22 hours per hectare in 2017–20.

The yield gap across states is distinctly visible and the rate of growth in yield also varied across states. The average yield for Punjab was highest at 65 quintals per hectare across all the three-year periods and the average yield for Odisha, Uttar Pradesh, and West Bengal was below 40 quintals per hectare. In terms of input use, fertilizer use has declined in Punjab, while increasing in other states. Tamil Nadu and Andhra Pradesh had the highest average fertilizer use (across all years) at 228 kg per hectare and 222 kg per hectare respectively.

Comparison of incomes, costs, yields, and input use across different groups of states shows an interesting pattern (Figure 3.3). Higher yields are correlated with increased incomes — especially in states such as Punjab, Tamil Nadu, and Andhra Pradesh. These states also had higher use of fertilizers, insecticides, and machine use per hectare. The states that lagged — Uttar Pradesh, Odisha, and West Bengal — had low input use in all these three categories. It is noteworthy that this has happened when the costs are converging for both groups of states, implying that despite spending more on various inputs, the yields of the crop and incomes have not grown sufficiently in low-performing states.

Table 3.3 *Costs, incomes, yields, and input use for paddy, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Group 1 refers to Andhra Pradesh, Punjab, and Tamil Nadu, and Group 2 refers to Odisha, Uttar Pradesh, and West Bengal.

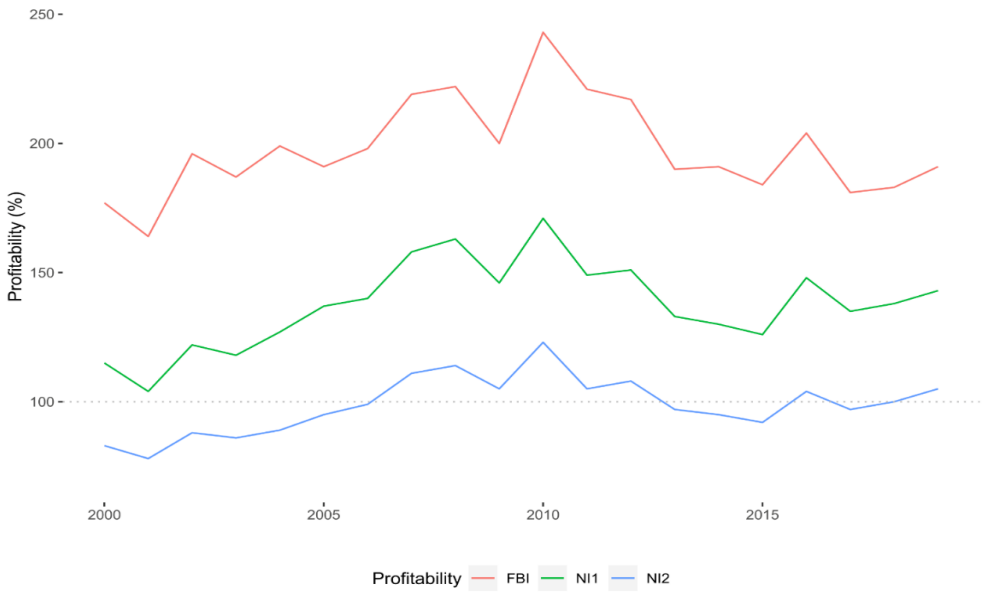
4 Maize

The maize crop constituted about 5 per cent of the gross cropped area (Government of India 2022). According to the SAS 2021 report, about 11 per cent of households reported cultivation of maize during the kharif season; the share of households reporting maize cultivation for the rabi season was about 4 per cent (Government of India 2021a).

4.14.1 Profitability, Income, and Costs

The all-India profitability at Cost A2 of maize has declined constantly since 2010–11 after peaking at 243 per cent. The three measures of profitability increased in the first decade of the study, while the second decade witnessed declining trends (Figure 4.1). The average profitability at Cost A2 from maize was 193 per cent across the years. The profitability at Cost A2 increased from 171 per cent in 2000–02 to 223 per cent in 2008–11. After this, the average declined to 185 per cent in 2017–20. The profitability, at Cost A2+FL, also follows a similar trend till the 2014–17 period, after which the profitability increased marginally in 2017–20. The average profitability at Cost C2 remained low and it was below 100 per cent for three three-year periods indicating negative returns from maize cultivation.

Figure 4.1 *Profitability at Costs A2, A2+FL, and C2 for maize, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, the FBI has averaged Rs 7,100 per hectare across the years. The FBI increased from Rs 3,507 per hectare in 2000–02 to Rs 8,480 per hectare in 2008–11 (Table 4.1). The next two

three-year periods, 2011–14 and 2014–17 witnessed a marginal decrease of Rs 15 and Rs 318 per hectare respectively. The average FBI increased in 2017–20 to Rs 8,563 per hectare. In terms of growth rates, the FBI increased at a rate of 40 per cent, 31 per cent, and 32 per cent from periods 2000–02 to 2002–05, 2002–05 to 2005–08, and 2005–08 to 2008–11 respectively. The growth rate remained low, even negative, in the last decade. The rate increase in the FBI was 0 per cent, -4 per cent, and 5 per cent from period 2008–11 to 2011–14, 2011–14 to 2014–17, and 2014–17 to 2017–20 respectively. The NI1 followed trends like the FBI across the years. Whereas, at Cost C2, the three-year average NI2 for 2000–02, 2002–05, and 2014–17 were negative at Rs -2,086, Rs -1,272, and Rs -502 per hectare respectively. It was the lowest for 2000–02 among the three-year periods under consideration.

Table 4.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for maize, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	8,931	5,424	8,201	11,017	3,507	730	-2,086
2002–05	10,407	5,502	8,390	11,678	4,904	2,017	-1,272
2005–08	12,817	6,378	8,698	12,316	6,439	4,119	501
2008–11	15,723	7,243	9,777	13,731	8,480	5,945	1,991
2011–14	16,893	8,428	11,633	16,177	8,465	5,260	717
2014–17	17,712	9,565	13,227	18,213	8,147	4,485	-502
2017–20	19,027	10,465	13,650	18,812	8,563	5,377	215

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

Maize cultivation has witnessed an increase in the cost of cultivation over the years. The real Cost A2 averaged Rs 7,680 per hectare across the years. The real Cost A2 increased from Rs 5,424 per hectare in 2000–02 to Rs 10,465 per hectare in 2017–20 (Table 4.1). In terms of growth rate, the Cost A2 increased at a rate of 1 per cent, 16 per cent, 14 per cent, 16 per cent, 13 per cent, and 9 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, 2005–08 to 2008–11, 2008–11 to 2011–14, 2011–14 to 2014–17, and 2014–17 to 2017–20 respectively. Costs A2+FL and C2 followed similar trends across the three-year average periods.

The inter-state disparities are captured through the state-level analysis. The CV for the measures of income across the states shows an increased variation in the first decade. And, in the second

decade, the variation decreased substantially, especially after 2009. While this trend continued till 2016, an increase in variation across states was noticeable afterwards (Figure A-2). The variation in cost measures increased in the first decade and decreased in the second decade. Variations in yield have also increased in the first decade and reduced in the second decade. In other words, variation across states in terms of costs, yields, and incomes have broadly moved in the same direction with reduced variation in each measure more visible in the second decade.

Bihar and Rajasthan were two states with higher average profitability than the all-India average. Uttar Pradesh, Karnataka, and Madhya Pradesh had lower average profitability than the all-India average across the years. The average profitability at Cost A2 for Bihar and Rajasthan was 236 per cent and 211 per cent across the years. Despite the high profitability, Rajasthan had a lower FBI than the all-India average. The average FBI was higher for Bihar and Karnataka at Rs 11,075 and Rs 7,188 per hectare respectively. The cost of cultivation was also higher for Bihar and Karnataka (Rs 8,190 and Rs 7,885) than the all-India average.

4.24.2 Cost Components and Prices

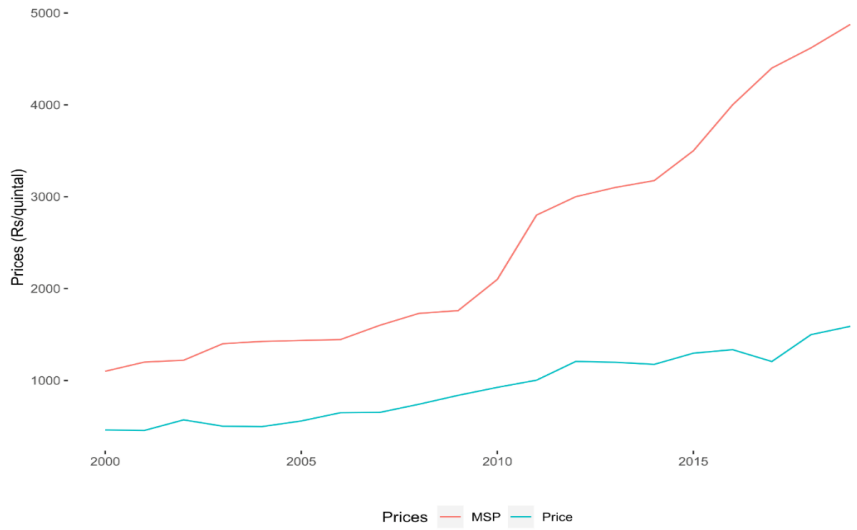
The human labour cost remained contributing, on average, one-fourth share in the total Cost A2. The share of human labour in Cost A2 has increased from 22 per cent in 2000–02 to 31 per cent in 2011–14, after which it declined to 26 per cent in 2017–20. The share of machine labour cost has also increased from 10 per cent in 2000–02 to 22 per cent in 2017–20. Machine labour cost had the second largest share in Cost A2 in recent years. The fertilizer costs contributed almost 16 per cent share in the Cost A2 across the years. Though, its share has declined by almost 4 per cent from 17 per cent in 2000–02 to 13 per cent in 2017–20. The animal labour cost share has declined gradually across three-year periods from 22 per cent in 2000–02 to 10 per cent in 2017–20. The share of manure cost has also decreased from 9 per cent in 2000–02 to 4 per cent in 2017–20.

The average share of human labour cost in Cost A2 was higher than the all-India average for Bihar, Karnataka, and Uttar Pradesh. Madhya Pradesh and Rajasthan had lower human labour cost share in the Cost A2 than the all-India average. Rajasthan had the lowest human labour share in Cost A2. The average machine labour cost share was highest for Uttar Pradesh at 23 per cent. But the increase across periods was highest for Rajasthan from 5 per cent in 2000–02 to 34 per cent in 2017–20. The average share of fertilizer cost in Cost A2 was higher than the all-India average for Bihar and Karnataka. The share of animal labour cost in Cost A2 has declined for all the states;

but the states of Karnataka, Madhya Pradesh, and Rajasthan had a higher share than the all-India average.

The prices realised by the farmers for maize crops were less than the MSP announced by the government for all the years across all the states (Figure 4.2). There was not a single instance when the prices realised were higher than MSP. The gap between the prices realised and MSP has widened even more in the second decade. The MSP and prices diverged the most in 2019–20 when the MSP were Rs 3,286 higher than the price realised, at all-India levels. The prices received were slightly higher than the all-India average for the states of Rajasthan and Karnataka across the periods. Still, the prices realised were nowhere near the MSP for any state. The gap between the prices and MSP was higher for Bihar, Madhya Pradesh, and Uttar Pradesh.

Figure 4.2 *Prices realised by farmers (implicit rate) and MSP for maize, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

4.3 Yields and Input Use

The all-India average yields from maize cultivation have increased across the years, with a slight decline in recent years. The average yield at the all-India level was 26 quintals per hectare across the years. The yield has increased from an average of 17 quintals per hectare in 2000–02 to 35 quintals per hectare in 2017–20. The data from the crop production statistics show that yields increased from 18 quintals per hectare in 2000–01 to 30 quintals per hectare in 2019–20. While there was an increase in the yields, we observed a marginal decline in average seed use per hectare at the all-India level. The seed use declined from 24 kg per hectare in 2000–02 to 21 kg per hectare

in 2014–17. Fertilizer use at the all-India level has increased by almost 114 per cent. It increased from 76 kg per hectare in 2000–02 to 161 kg per hectare in 2017–20. This indicates that higher yields are perhaps due to the influx of high-yielding variety (HYV) seeds and increased fertilizer use in the last two decades. Human labour use has declined at the all-India level from 632 hours per hectare in 2000–02 to 479 hours per hectare in 2017–20.

Bihar had the highest average yield among all the states at 34 quintals per hectare followed by Karnataka at 29 quintals per hectare. The yield for these two states was higher than the all-India average. The yields were lower than the all-India average for Madhya Pradesh, Rajasthan, and Uttar Pradesh. Rajasthan had the highest average seed use at 30 kg per hectare and it is the only state with seed use higher than the all-India average. Karnataka had the lowest average seed use at 17 kg per hectare across the years. The average fertilizer use was highest for Karnataka at 146 kg per hectare across the years which was followed by Bihar at 136 kg per hectare. The fertilizer use for Karnataka and Bihar was higher than the all-India average. The average human labour use was highest for Uttar Pradesh at 638 hours per hectare, followed by Rajasthan and Bihar. These three states had average human labour use higher than the all-India average. Madhya Pradesh had the lowest average human labour use at 425 hours per hectare.

A comparison between Bihar and other selected states brings out several interesting insights (Figure 4.3). While the real costs and yields have increased across years for Bihar, there was a sudden spurt in real FBI during the late 2000s and the early 2010s. Even though the yield levels were higher in the later periods, the FBI had come down. Although the input use and costs of other states have increased in the meantime, there remains a gap in real incomes between Bihar and other states in recent years.

Figure 4.3 *Costs, incomes, yields, and input use for maize, all-India and groups of states, 2000–01 to 2019–20*

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Others refer to Karnataka, Madhya Pradesh, Uttar Pradesh, and Rajasthan.

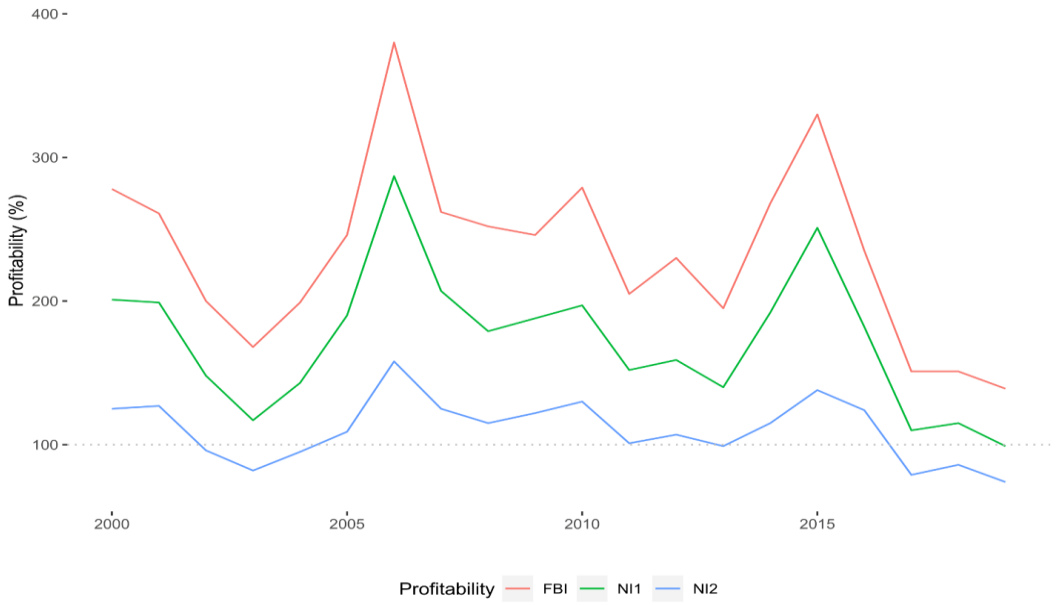
5 Urad

The CCPC Scheme covered 11 states for black gram (*urad*) in the recent cycle (2017–20). According to the Situation Assessment Surveys, about 4 per cent of the agricultural households across India reported cultivation of *urad* during the kharif season (Government of India 2021a).

5.1 Profitability, Income, and Costs

Urad has shown high movements in profitability across the years, as well as during the three-year periods of analysis (Figure 5.1). The all-India profitability at Cost A2 was 270 per cent in 2000–02. It decreased to 189 per cent in 2002–05 and increased to 296 per cent in 2005–08. After this, it decreased to 210 per cent in 2011–14. The profitability at Cost A2 rose sharply to 278 per cent in 2014–17 and declined by 131 percentage points to 147 per cent in 2017–20. The profitability at Cost A2+FL also fluctuated over time. During 2002–05 and 2017–20, the average profitability at Cost C2 was lower than 100 per cent, indicating average losses.

Figure 5.1 *Profitability at Costs A2, A2+FL, and C2 for* urad*, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The average real FBI for all years was Rs 5,646 per hectare. The average FBI decreased from Rs 5,999 to Rs 2,670 per hectare from 2000–02 to 2002–05 (Table 5.1). It increased from this level to Rs 7,381 per hectare in 2005–08. After declining to Rs 5,428 per hectare in 2011–14, it increased to the highest value of Rs 8,980 per hectare in 2014–17. There was a sharp reduction after this when the average FBI reduced to Rs 2,641 per hectare in 2017–20. The average NI1 across the

years was Rs 4,173 per hectare, with 2017–20 witnessing the lowest value at Rs 607 per hectare. The average NI2 was negative for two time periods, Rs -670 per hectare in 2002–05 and Rs -1942 per in 2017–20.

Table 5.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for* urad*, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	10,062	4,062	5,200	7,913	5,999	4,863	2,149
2002–05	6,293	3,622	4,829	6,963	2,670	1,464	-670
2005–08	11,489	4,109	5,213	8,390	7,381	6,277	3,099
2008–11	11,093	4,549	5,947	8,990	6,544	5,145	2,103
2011–14	10,880	5,452	7,222	10,332	5,428	3,658	548
2014–17	14,175	5,196	6,976	10,942	8,980	7,200	3,234
2017–20	8,228	5,588	7,621	10,170	2,641	607	-1,942

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The average real Cost A2 was Rs 4,683 per hectare across the years. Cost A2 was highest in 2011–12 (Rs 6,257 per hectare) and was lowest in 2004–05 (Rs 3,422 per hectare). Cost A2 has increased across the three-year periods, except for 2002–05 and 2014–17. Period-wise highest average Cost A2 was incurred in 2017–20, Rs 5,588 per hectare. Cost A2+FL followed a similar trend like Cost A2 across periods, but the gap between these two has widened across periods. Cost C2 peaked during 2014–17 at Rs 10,942 per hectare, which declined to Rs 10,170 per hectare in 2017–20. For *urad*, operational costs constituted around 65 per cent of the total costs and fixed costs constituted 35 per cent of the total cost.

The state-level trends point out the variations in profitability, incomes, and costs of cultivation. The variation across states in real FBI has increased in recent years and Cost A2 has reduced (Figure A-3). However, such a trend is not visible for Cost A2+FL, with the variation increasing over time in the second decade. The variation across states in yields has not changed much over the years. Similar is the case also with profitability at Cost A2, with variations across states unchanged over the last two decades.

The average profitability at Cost A2 for Andhra Pradesh was 311 per cent, and this ranged between 149 per cent and 581 per cent across the years. The average real FBI for Andhra Pradesh was Rs 11,198 per hectare, ranging between Rs 2,750 and Rs 26,718 per hectare. Despite having an average profitability at Cost A2 (211 per cent) below the all-India average, Tamil Nadu had the average real FBI (Rs 5,778 per hectare) above the all-India average of (Rs 5,646 per hectare). Odisha, which had profitability at Cost A2 close to Andhra Pradesh (306 per cent), had FBI below the all-India average at Rs 5,213 per hectare. Among the major cultivating states, Odisha and Uttar Pradesh had many years with negative incomes at Cost C2.

5.2 Cost Components and Prices

Machine labour cost as a per centage share of Cost A2 increased across the years. The share increased from 11 per cent of Cost A2 in 2000–02 to 32 per cent in 2017–20. Insecticide costs as a share of Cost A2 increased from 3 per cent in 2000–02 to 7 per cent in 2017–20. On the other hand, the animal labour cost as a share of Cost A2 decreased from 20 per cent in 2000–02 to 5 per cent in 2017–20. Human labour cost decreased from 33 per cent of Cost A2 in 2000–02 to 24 per cent in 2005–08. But its share increased to 37 per cent in 2011–14. After 2011–14, the human labour costs declined to 28 per cent in 2017–20. The average irrigation cost share remained around 1 per cent across the periods.

The total human labour cost (casual and attached *plus* family labour) as a share of Cost A2+FL remained high with an average share of 47 per cent across the periods. The average family labour cost alone constituted about 24 per cent share for Cost A2+FL. The average across periods for machine labour cost was about 15 per cent. It increased from 9 per cent in 2000–02 to 23 per cent in 2017–20.

Across states, the share of machine labour cost was highest for Uttar Pradesh (41 per cent of Cost A2 in 2017–20). Andhra Pradesh's share was just 14 per cent. Andhra Pradesh and Tamil Nadu had the highest shares of human labour cost in Cost A2, 43 and 41 per cent respectively. This was lowest for Odisha across all the periods, with an average of 24 per cent across periods. The share of fertilizer cost in Maharashtra in Cost A2 was about 10 per cent across the years. On the other hand, for Uttar Pradesh and Odisha, the average share of fertilizer cost was less than 1 per cent across the years.

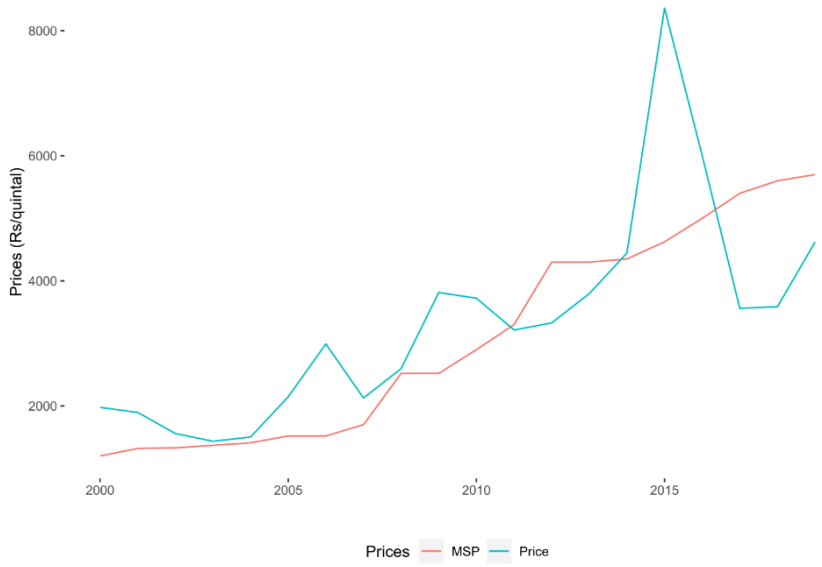
Andhra Pradesh had the lowest share of family labour in Cost A2+FL, with an average of just 9 per cent. For Odisha, this share was averaging 44 per cent across the periods. The share of family

labour in Cost A2+FL increased from 35 per cent in 2000–02 to 56 per cent in 2017–20. States like Maharashtra, Andhra Pradesh, and Tamil Nadu witnessed fluctuations in the family labour share.

The all-India average prices received by farmers from 2000–01 to 2009-10 for *urad* were higher than the MSP announced by the government (Figure 5.2). In the second decade, there were price fluctuations and for six years from 2010-11 to 2019–20, the prices realised by farmers were less than the MSP announced by the Government of India. The farm prices, after a steep rise in 2015-16 to Rs 8,361 per quintal, fell to Rs 3,561 per quintal in 2017-18. The prices were well below the MSP after this brief interval.

Uttar Pradesh and Maharashtra, which had lower profitability measures and returns, witnessed lower prices than the MSP in recent years. All states experienced a sudden dip in prices after 2015-16. The gap between prices realised and the MSP has reduced for Maharashtra. But this gap remained substantially wider for Uttar Pradesh.

Figure 5.2 *Prices realised by farmers (implicit rate) and MSP for* urad*, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

5.3 Yields and Input Use

The yield of *urad* has remained between 4 quintals per hectare to 7 quintals per hectare across the years. Data from the crop production statistics, based on a different methodology of estimating

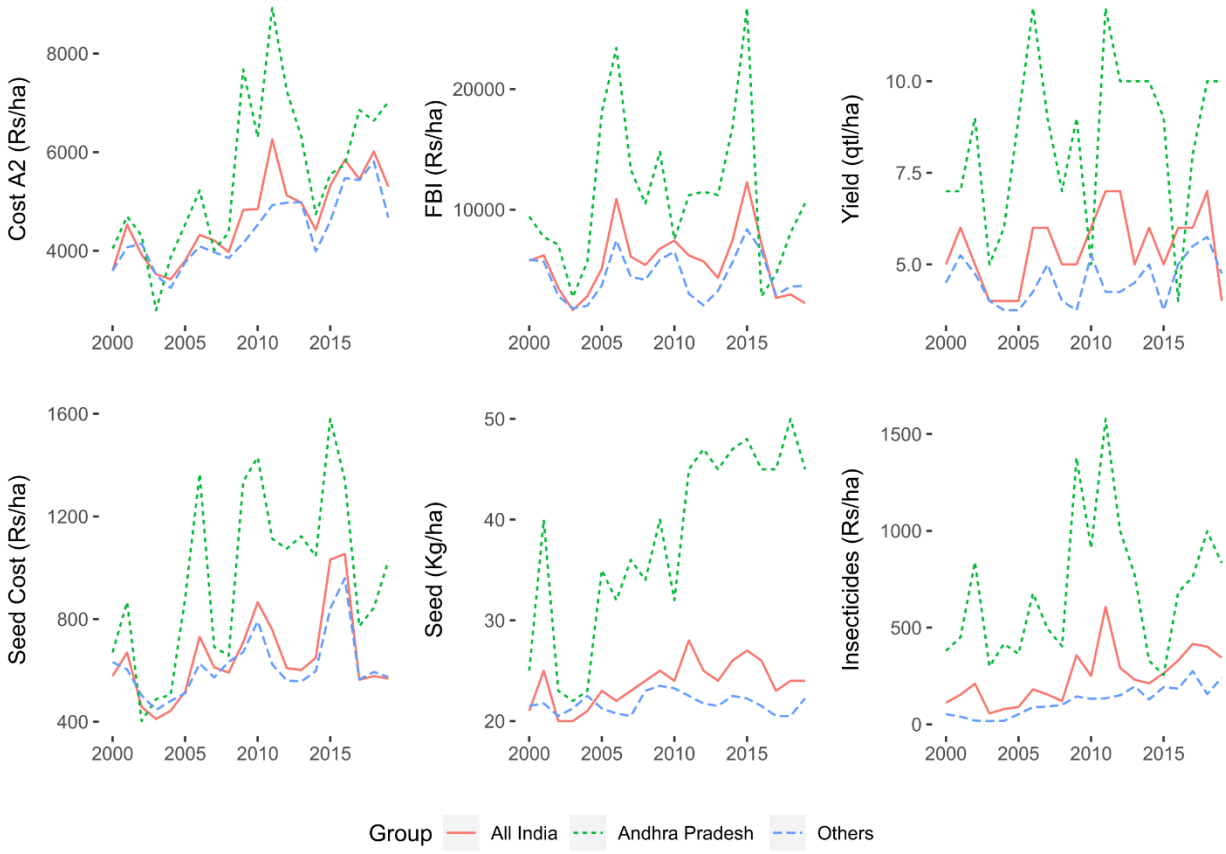
yields, also shows that yields remained between 4 quintals per hectare and 7 quintals per hectare across the years. The yield was highest for the years 2011–12, 2012–13, and 2018–19 at 7 quintals per hectare. The years 2003–04, 2004–05, and 2019–20 witnessed the lowest yield at 4 quintals per hectare. However, the three-year average yields show a picture of stagnation: the average all-India yield was about 6 quintals per hectare for 2000–02 and 2017–20, with no period of substantial increase.

The all-India average seed use was 24 kg per hectare across the years. It came down from 23 kg per hectare during 2000–02 to 20 kg per hectare in 2002–05 and then went up to 26 kg per hectare in 2011–14 and 2014–17. The fertilizer use increased from 19 kg per hectare during 2000–02 to 36 kg per hectare in 2017–20. Human labour use has declined substantially from 379 hours per hectare during 2000–02 to 274 hours per hectare during 2017–20, a decline of about 100 hours per hectare. Animal labour use also declined from 42 hours per hectare in 2000–02 to just 6 hours per hectare in 2017–20.

In the last two periods, that is 2014–17 and 2017–20, most states witnessed very low yields. Andhra Pradesh had the highest yields (8 quintals per hectare) across the years. Uttar Pradesh and Odisha witnessed the lowest yields (4 quintals per hectare). Maharashtra has the highest human labour use across the states with an average of 446 hours per hectare, whereas for Andhra Pradesh the average human labour use was just 246 hours per hectare. For Uttar Pradesh and Tamil Nadu, there was an increase in human labour use in 2017–20 after a decline in the earlier three-year periods. Maharashtra had the highest average fertilizer use across periods (53 kg per hectare), followed by Tamil Nadu (30 kg per hectare). States like Odisha and Uttar Pradesh had very low fertilizer use over the years.

The group-wise analysis of various states shows a difference in the yields, probably owing to the difference in seed use and insecticide costs. The differences in yields also contributed to the variation in FBI across states. The variations are visible in the case of Andhra Pradesh and other states (Maharashtra, Odisha, Tamil Nadu, and Uttar Pradesh) (Figure 5.3). The seed use for Andhra Pradesh increased over years partially contributing to higher yields. The yield dropped below the all-India average for a few years after 2015, which has again picked up in recent years. The FBI also reflects a similar trend. For the other states, the seed and insecticide use along with the yields remained low across the years.

Figure 5.3 *Costs, incomes, yields, and input use for* urad*, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Notes: Others refer to Maharashtra, Odisha, Tamil Nadu, and Uttar Pradesh.

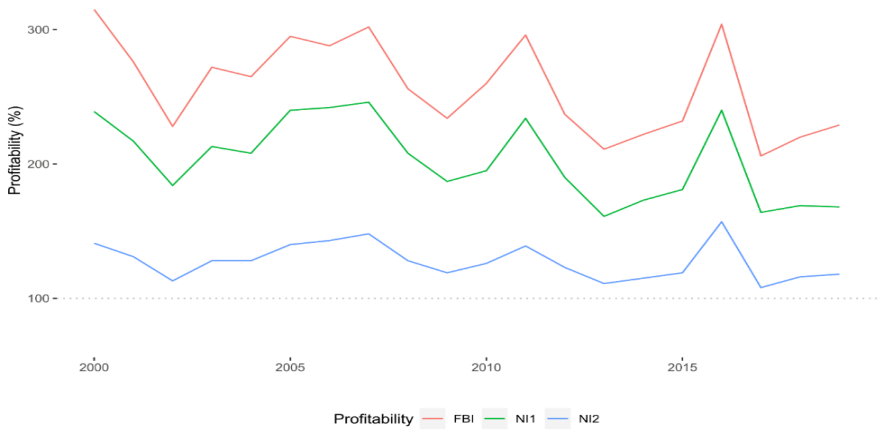
6 Gram

Gram, a major pulse crop, accounted for 4.58 per cent of the gross cropped area and 32 per cent of the total area cropped under pulses in 2018–19 (Government of India 2022). According to the Situation Assessment Survey, 6.7 per cent of the households reported cultivation of gram during the rabi season (Government of India 2021a).

6.1 Profitability, Income, and Costs

The all-India profitability at Cost A2 averaged 257 per cent from 2000–01 to 2019–20. While it had witnessed many ups and downs across this 20-year period, the overall trend is declining across the years. The profitability at Cost A2 peaked in 2000–01 at 315 per cent (Figure 6.1). The lowest profitability at Cost A2 was in 2017–18, 206 per cent. The three-year average profitability at Cost A2 was highest in 2000–02 (296 per cent). It declined to 255 per cent during 2002–05, then rose to 295 per cent in 2005–08. Since then, profitability at Cost A2 has declined for all the consecutive periods, except for 2014–17 when it witnessed a slight increase of 6 percentage points. The last three years, 2017–20, witnessed the lowest profitability at Cost A2 — 218 per cent. The all-India profitability at Cost A2+FL declined from 228 per cent in 2000–02 to 167 per cent in 2017–20. The all-India profitability at Cost C2 averaged 128 per cent across the years.

Figure 6.1 *Profitability at Costs A2, A2+FL, and C2 for gram, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019-20.

In real terms, the all-India average FBI remained fluctuating over years. FBI peaked in 2015-16 at Rs 15,876 per hectare. The average FBI across years was Rs 9,052 per hectare. The average FBI across the three-year periods, decreased from Rs 10,014 per hectare in 2000–02 to Rs 7,272 per

hectare in 2002–05 (Table 6.1). It increased to Rs 10,478 per hectare in 2005–08. The FBI decreased to Rs 7,569 per hectare in 2008-14 and witnessed a rise in the next two periods to Rs 10,648 per hectare in 2014–17. This dipped to Rs 8,398 per hectare in 2017–20. The all-India average NI2 was the lowest in 2017–20, at Rs 1,923 per hectare.

Table 6.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for gram, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	15,225	5,212	6,726	11,186	10,014	8,500	4,040
2002–05	12,103	4,824	6,041	9,866	7,279	6,063	2,238
2005–08	16,100	5,623	6,735	11,236	10,478	9,365	4,864
2008–11	13,026	5,457	6,725	10,551	7,569	6,301	2,475
2011–14	16,021	6,724	8,291	12,829	9,297	7,730	3,191
2014–17	18,041	7,387	9,105	13,720	10,654	8,936	4,321
2017–20	16,102	7,704	9,758	14,178	8,398	6,343	1,923

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The trends show that the real costs at the all-India level have increased across the years with slight fluctuations. The Cost A2 peaked in 2016-17 at Rs 8,548 per hectare. The period-wise trends also point to an increase in real costs, with exceptions in 2002–05 and 2008–11. Cost A2 was highest in 2017–20 (Rs 7,704 per hectare). Cost A2+FL and C2 also reached their peak levels in 2016–17 at Rs 10,395 and Rs 15,748 per hectare respectively. The average share of operational cost in the total cost increased from 57 per cent in 2000–02 to 67 per cent in 2017–20.

The CV for the measures of income across the states shows an increased variation over time, especially after 2010 (Figure A-4). Like several other crops, this has happened while the variation in costs has reduced, implying sharper reductions in incomes for some states than others. The variation in profitability at Cost A2 (FBI Profitability) has increased over the last two decades, with differences in yields across states remaining unchanged in the last decade.

The specific states under consideration had profitability at Cost A2 higher than the all-India average (257 per cent). The profitability at Cost A2 was highest for Rajasthan with an average of 320 per cent across the years. It was the lowest for Madhya Pradesh, averaging 262 per cent across

the years. Rajasthan had the lowest Cost A2 and A2+FL, contributing to high profitability measures. Interestingly, the FBI was highest for Madhya Pradesh followed by Uttar Pradesh. Despite high profitability at Cost A2 and low cost of cultivation, the average FBI for Rajasthan was lowest across the periods.

6.2 Cost Components and Prices

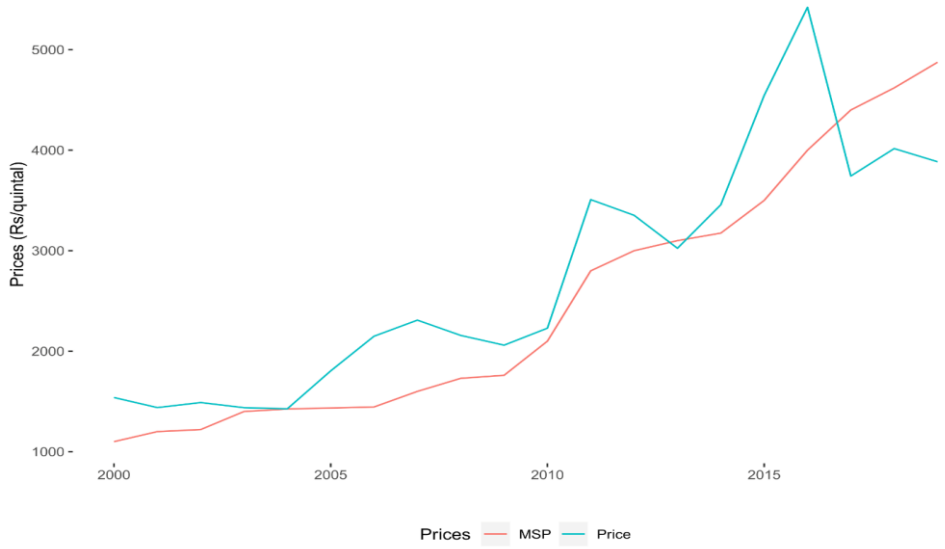
For gram, the human labour cost as a share of Cost A2 increased across the three-year periods. It went up from 12 per cent in 2000–02 to 22 per cent in 2017–20, except for a 1 percentage point decline from 2011–14 to 2014–17. The share of machine labour in Cost A2 also increased from 18 per cent in 2000–02 to 25 per cent in 2017–20, with some fluctuations in the three-year periods. The animal labour cost as a share of Cost A2 has fallen sharply from 13 per cent in 2000–02 to 5 per cent in 2017–20. The average seed cost also constituted a major share in Cost A2 (24 per cent), though it declined from 28 per cent in 2000–02 to 19 per cent in 2017–20. While looking at Cost A2+FL, the human labour cost share increased from 32 per cent in 2000–02 to 38 per cent in 2017–20, with casual human labour cost share increasing more than the share of family labour cost share throughout the three-year periods.

The state-specific analysis shows differential cost component shares. The share of human labour in Cost A2, though increased for all states, rose rapidly for Rajasthan from 6 per cent in 2000–02 to 22 per cent in 2017–20. The share of animal labour substantially declined for all states over the years. The average share of seed cost in Cost A2 was the highest for Uttar Pradesh at 29 per cent. The share of seed cost declined during 2017–20 for all the states. The average family labour cost share in Cost A2 +FL was also highest for Uttar Pradesh at 36 per cent. It was lowest in Madhya Pradesh at just 17 per cent of Cost A2+FL.

The prices realised by the farmers have fallen below the MSP in recent years. The prices realised remained above the MSP until 2017–18 (except 2013–14), after which it slipped below the MSP. The gap between the two has increased recently. The prices peaked during 2016–17 at Rs 5,422 per quintal (current prices), when the MSP was Rs 4,000 per quintal. In 2017–18, the prices dropped drastically to Rs 3,743 per quintal. The gap between the prices realised and the MSP expanded by almost Rs 1,000 per quintal. In real terms, the prices realised have fallen from Rs 1,606 to Rs 1,262 per quintal from 2014–17 to 2017–20. Uttar Pradesh, on average across the years, received higher prices among the states under study. The average decline in the prices was also less for Uttar Pradesh in 2017–20. For Uttar Pradesh, the gap between the MSP and the prices

was Rs 456 per quintal whereas, for Madhya Pradesh, this gap was Rs 912 per quintal during 2017–20.

Figure 6.2 *Prices realised by farmers (implicit rate) and MSP for gram, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

6.3 Yield and Input Use

The average all-India yield of gram across the years was 10 quintals per hectare and it ranged between 8 quintals per hectare and 12 quintals per hectare. Data from the crop production statistics show that yields increased from 7 quintals per hectare in 2000–01 to 11 quintals per hectare in 2019–20. The average yield declined from 10 quintals per hectare in 2000–02 to 9 quintals per hectare in 2002–05 and 2005–08. It increased to 10 quintals per hectare in 2008–11 and remained the same until 2014–17, after which it increased to 12 quintals per hectare in 2017–20.

The all-India average fertilizer use has increased across the periods, from 25 kg per hectare in 2000–02 to 53 kg per hectare in 2017–20. The average human labour across the years was 293 hours per hectare and it ranged between 267 and 326 hours per hectare. The average human labour use increased in recent years, after a marginal decrease in the initial three-year periods. Animal labour use has decreased from 47 hours per hectare in 2000–01 to 6 hours per hectare in 2019–20. Average seed use was at 79 kg per hectare across the years. The three-year averages show that seed use first decreased from 81 kg per hectare in 2000–02 to 76 kg per hectare in 2005–08. It

increased until 2014–17 to 84 kg per hectare. The average seed use decreased by 2 kg per hectare in 2017–20, to 82 kg per hectare.

There was no big difference in yields between the states. However, Rajasthan had the lowest average yield across the years at 9 quintals per hectare. Whereas, Madhya Pradesh had the highest average yield of 11 quintals per hectare across the years. The input use varied across states, the average seed use was lowest for Rajasthan at 60 kg per hectare, the state with the lowest yield. The seed use has increased across three-year periods by almost 7 kg per hectare for Rajasthan, from 58 kg per hectare in 2000–02 to 65 kg per hectare in 2017–20. Uttar Pradesh and Madhya Pradesh had average seed use of around 90 kg per hectare. There was a substantial gap between human labour use across the states. Uttar Pradesh had an average of 363 hours per hectare whereas human labour use was about 260 hours per hectare for Madhya Pradesh and Rajasthan. Human labour use had shown an increase for Rajasthan and Madhya Pradesh, whereas it has declined for Uttar Pradesh in the last three-year period, 2017–20. Animal labour use has declined substantially for all states and it has come down to almost 2 hours per hectare for all these states.

The movements in costs, incomes, yields, and input use show two groups of states — Rajasthan and Others (Uttar Pradesh and Madhya Pradesh) (Figure 6.3). Despite having lower costs per hectare, partly on account of lower fertilizer and seed costs, the yields in the last five years have gone up for Rajasthan. The fluctuations in the FBI across the years for both groups are visible from the trends.

Figure 6.3 *Costs, incomes, yields, and input use for gram, all-India and groups of states, 2000–01 to 2019–20*

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Others refer to Madhya Pradesh and Uttar Pradesh.

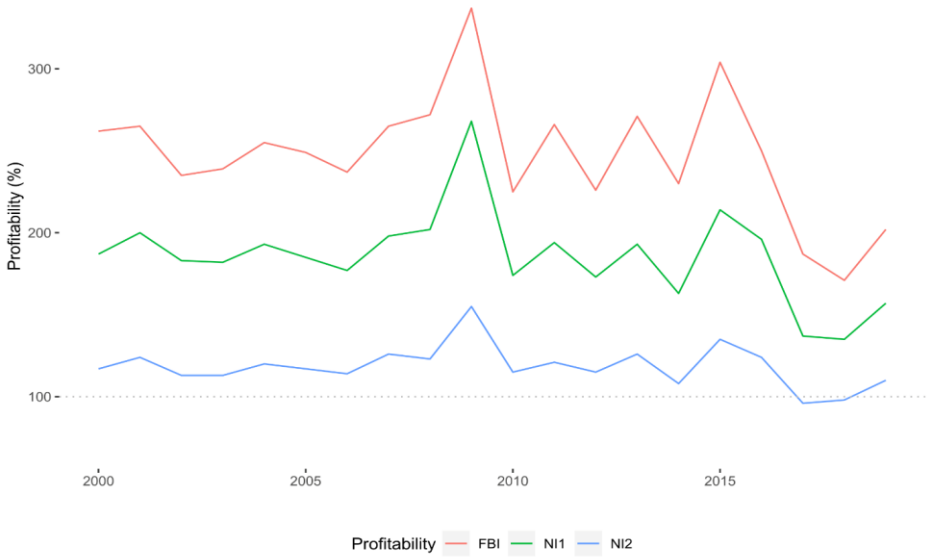
7 Arhar/ Tur

Pigeon pea (*arhar*) is a major pulse crop that accounted for 2.21 per cent of the gross cropped area in 2018-19 (Government of India 2022). According to SAS, 2021, about 2.9 per cent of households reported *arhar* cultivation during the kharif season (Government of India 2021a).

7.1 Profitability, Income, and Costs

The average all-India profitability at Cost A2 from *arhar* cultivation was 247 per cent across the years. The profitability at Cost A2 peaked at 337 per cent in 2009–10 and touched a low of 171 per cent in 2018–19 (Figure 7.1). In terms of a three-year average, the average profitability at Cost A2 declined from 264 per cent in 2000–02 to 243 per cent in 2002–05. It increased to 250 per cent and 278 per cent in 2005–08 and 2008–11 respectively. After 2008–11, the average profitability at Cost A2 was 254 per cent in 2011–14 and 261 per cent in 2014–17. It declined steeply in 2017–20 to 187 per cent, a decline of almost 74 per cent points. The profitability at Cost C2 fell below 100 per cent during 2017–18 and 2018–19 indicating net losses from the *arhar* cultivation.

Figure 7.1 *Profitability at Costs A2, A2+FL, and C2 for* arhar*, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, the all-India average FBI from *arhar* cultivation was Rs 9,903 per hectare across the years. The FBI peaked in 2015–16 at Rs 19,492 per hectare. In terms of the three-year average, FBI increased from Rs 7,090 per hectare in 2000–02 to Rs 11,828 per hectare in 2008–11 and decreased marginally to Rs 11,730 per hectare in 2011–14 (Table 7.1). After this marginal decrease,

the average FBI again increased to Rs 13,970 per hectare in 2014–17 and again decreased substantially to Rs 8,070 per hectare by almost Rs 6,000 per hectare in 2017–20. In terms of growth rate, the FBI increased at a rate of 7 per cent, 7 per cent and 46 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, and 2005–08 to 2008–11 respectively. FBI witnessed a marginal negative growth rate of -1 per cent from 2008–11 to 2011–14 and again increased at a rate of 19 per cent from 2011–14 to 2014–17. The FBI witnessed a negative growth rate of -42 per cent from 2014–17 to 2017–20. The NI1 and NI2 followed similar growth rate trends over the years. The NI2 was negative for the year 2017–18 at Rs -1,679 per hectare (although the weighted average profitability was less than 100 per cent for two years).

Table 7.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for* arhar*, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	11,832	4,742	6,216	9,776	7,090	5,616	2,055
2002–05	13,454	5,851	7,334	11,488	7,603	6,121	1,967
2005–08	14,602	6,498	8,203	12,386	8,104	6,399	2,216
2008–11	19,610	7,782	9,679	15,128	11,828	9,931	4,482
2011–14	20,221	8,491	11,201	16,783	11,730	9,020	3,437
2014–17	23,356	9,386	12,413	18,958	13,970	10,943	4,399
2017–20	18,020	9,959	12,589	17,424	8,060	5,431	596

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The cost of cultivation for *arhar* has increased over the years. In real terms, the average Cost A2 was Rs 7,669 per hectare across the years. In terms of a three-year average, the Cost A2 has increased from Rs 4,742 per hectare in 2000–02 to Rs 9,959 per hectare in 2017–20. The periodic growth rates show that the Cost A2 increased at a rate of 23 per cent, 11 per cent, 20 per cent, 9 per cent, 11 per cent, and 6 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, 2005–08 to 2008–11, 2008–11 to 2011–14, 2011–14 to 2014–17, and 2014–17 to 2017–20 respectively. Cost A2 grew at more than 10 per cent across the three-year periods, except from 2014–17 to 2017–20 when the growth was 1 per cent.

The inter-state variation in profitability was more pronounced with average profitability at Cost A2 as high as 410 per cent for Uttar Pradesh and as low as 194 per cent for Andhra Pradesh across the years. Uttar Pradesh, along with Madhya Pradesh, had average profitability at Cost A2 higher

than the all-India weighted average, while Maharashtra, Karnataka, and Andhra Pradesh had average profitability at Cost A2 below the all-India weighted average. The CV for the measures of incomes showed a movement towards convergence for real FBI and NI1 in the first decade, which diverged in the second decade across the states (Figure A-5). The CV for the measures of costs, profitability, and yields also show a similar trend — with the variation across states increasing in the last decade.

In terms of specific features of major states, the average FBI for Uttar Pradesh was the highest at Rs 13,341 per hectare while it was lowest for Andhra Pradesh at Rs 6,595 per hectare across the years. Maharashtra, which had low profitability at Cost A2, had a higher average FBI across the years. For Andhra Pradesh, the average NI2 was negative at Rs -78 per hectare with 11 years of negative incomes at Cost C2. The average Cost A2 was highest for Maharashtra at Rs 10,830 per hectare across the years, whereas, Uttar Pradesh had the lowest average Cost A2 at Rs 4,555 per hectare across the years.

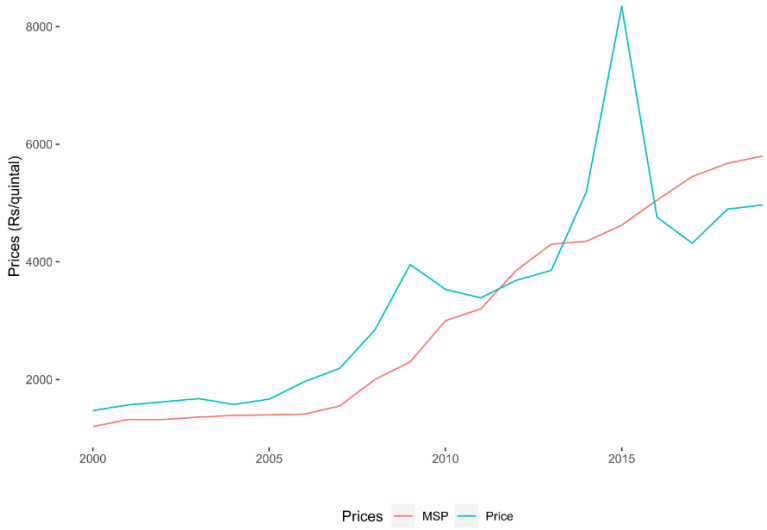
7.2 Cost Components and Prices

The average share of human labour cost (28 per cent) accounted for a major share of Cost A2. The average human labour share has fluctuated between 24 per cent and 32 per cent. The average machine labour cost share has increased from 7 per cent in 2000–02 to 24 per cent in 2017–20. The animal labour share increased from 25 per cent in 2000–02 to 31 per cent in 2002–05 and the share remained the same in 2005–08. After this, the animal labour share in Cost A2 decreased to 14 per cent in 2017–20. The average fertilizers cost share in Cost A2 was 9 per cent with some fluctuations across years. The insecticides cost share in Cost A2 has increased from 5 per cent in 2000–02 to 11 per cent in 2017–20. While the share of irrigation cost and manure cost in Cost A2 remained below 3 per cent over the years. The average share of family labour cost in Cost A2+FL was 22 per cent taking human labour cost share to 44 per cent.

The human labour cost share for all the states was a major constituent in Cost A2. Andhra Pradesh had a 35 per cent share in Cost A2. The average human labour share in Cost A2+FL was highest for Uttar Pradesh at 58 per cent. When the all-India weighted average seed cost share in Cost A2 was 6 per cent, it was 13 per cent for Madhya Pradesh and 11 per cent for Uttar Pradesh. The average fertilizer cost share was just 1 per cent for Uttar Pradesh and 12 per cent for Andhra Pradesh. The insecticide cost share in Cost A2 for Maharashtra witnessed a sharp increase from less than 1 per cent in 2000–02 to 13 per cent in 2017–20.

The prices realised for *arhar* fell below the MSP after 2011–12 (Figure 12.2). The prices realised remained below the MSP for most of the years, except for 2014–15 and 2015–16 when the prices spiked and touched an all-time high of Rs 8,344 per quintal in 2015-16. In real terms, the average prices realised were Rs 1,692 across the years. The three-year average shows that the prices fell in recent years from Rs 2,204 per quintal in 2014–17 to Rs 1,534 per quintal in 2017–20. The state-specific trends show that the average price realised was higher for Uttar Pradesh and lower than the all-India weighted average for Andhra Pradesh, Madhya Pradesh, Maharashtra, and Karnataka.

Figure 7.2 *Prices realised by farmers (implicit rate) and MSP for* arhar*, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

7.3 Yield and Input Use

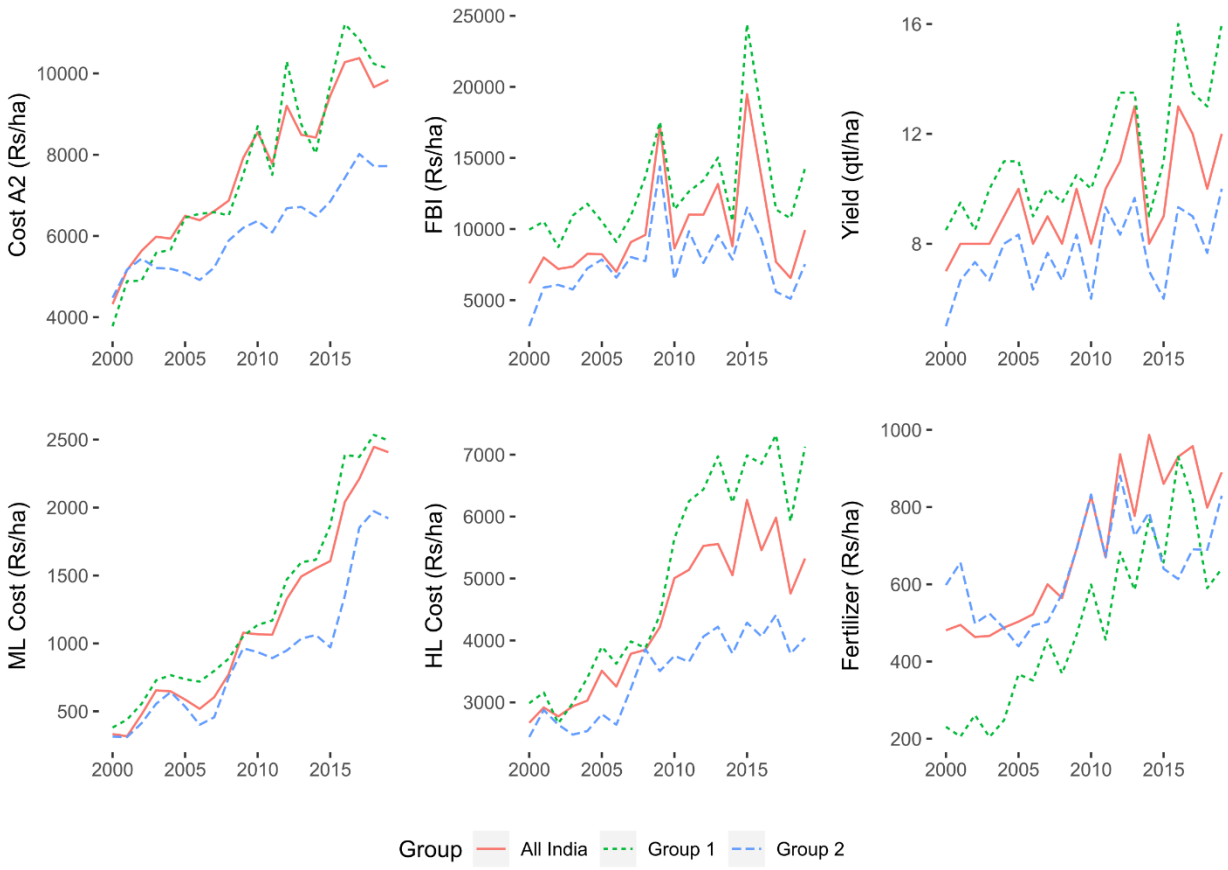
The yields from *arhar* cultivation varied between 7 quintals per hectare and 13 quintals per hectare across the years with an average yield of 10 quintals per hectare. The average all-India yield was 8 quintals per hectare in 2000–02 and it increased to 11 quintals per hectare in 2017–20. According to the crop production statistics, the all-India average yields increased from 6 quintals per hectare in 2000–02 to 9 quintals per hectare in 2017–20. The yield touched an all-time high of 13 quintals per hectare in 2013-14 and 2015-16. The average seed use increased marginally from 15 kg per hectare to 17 kg per hectare in 2017–20. The average fertilizer use has increased substantially from 37 kg per hectare in 2000–02 to 79 kg per hectare in 2008–11. After this increase, the average fertilizer use fell to 63 kg per hectare in 2011–14 and increased again to 79 kg per hectare in 2017–

20. Human labour use increased from 531 hours per hectare in 2000–02 to 631 hours per hectare in 2005–08 and decreased afterwards to 515 hours per hectare in 2017–20 with a slight increase in 2011–14. Similarly, animal labour use has increased from 70 hours per hectare in 2000–02 to 81 hours per hectare in 2005–08 and declined continuously since then to 37 hours per hectare in 2017–20.

The average yield was highest for Maharashtra at 13 quintals per hectare. The yield for the state has increased from 8 quintals per hectare in 2000–02 to 19 quintals per hectare in 2017–20. While, for Karnataka, the average yield was lowest at 7 quintals per hectare. The seed use was highest for Madhya Pradesh with an average yield of 8 quintals per hectare at 22 kg per hectare across the years, followed by Maharashtra at 19 kg per hectare. The average human labour use for Maharashtra (793 hours per hectare) was the highest, and it increased from 586 hours per hectare in 2000–02 to 893 hours per hectare in 2017–20.

The group-wise analysis shows that the gap in the yields is a major contributor to the high incomes — especially for Maharashtra and Uttar Pradesh (Figure 7.3). The states, Karnataka, Madhya Pradesh, and Andhra Pradesh, which had lower yields had lower FBI. The graph also shows that Cost A2 increased for all the states but for Maharashtra and Uttar Pradesh, which had lower Cost A2 in earlier years; it increased at a higher pace than Andhra Pradesh, Karnataka, and Madhya Pradesh. The fertilizer costs converged over time with a steady increase in costs for Maharashtra and Uttar Pradesh. The machine labour costs also increased for all the states, but the rate of increase was higher for Uttar Pradesh and Maharashtra.

Figure 7.3 *Costs, incomes, yields, and input use for* arhar*, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Group 1 refers to Maharashtra and Uttar Pradesh and Group 2 refers to Andhra Pradesh, Karnataka, and Madhya Pradesh.

8 Rapeseed and Mustard

The CCPC Scheme provided data on 11 states for Rapeseed and Mustard (mustard or R&M henceforth) cultivation for all years from 2000–01 to 2019–20. According to the Government of India (2021b), mustard constituted around 3 per cent of the total gross cropped area in 2018–19 with 7.5 per cent of households reporting cultivation in the rabi season (Government of India 2021a).

8.1 Profitability, Incomes, and Costs

The all-India average profitability at Cost A2 from R&M cultivation has been declining since 2011–14. The profitability at Cost A2 had increased from 270 per cent in 2000–02 to 401 per cent in 2008–11 at the all-India level (Figure 8.1). It declined to 352 per cent in 2011–14. It further came down to 283 per cent in 2017–20, a decline of 118 percentage points from 2008–11. The profitability of R&M at Cost A2+FL was more than 250 per cent from 2002–05 to 2008–11. It peaked in 2008–11 at 272 per cent and it had declined since then. There was no such period when the profitability at Cost C2 slipped below 100 per cent, indicating overall positive returns for the farmers.

Figure 8.1 Profitability at Costs A2, A2+FL, and C2 for mustard, all-India, 2000–01 to 2019–20 in per cent

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

Real FBI peaked in 2007–08 at Rs 17,886 per hectare at an all-India level. If three-year averages are considered, the real FBI increased from Rs 9,260 per hectare in 2000–02 to Rs 14,407 per

hectare in 2011–14, with a marginal decline of Rs 96 per hectare during 2008–11 (Table 8.1). The real FBI declined in 2014–17, to Rs 12,463 per hectare. It marginally increased from this level to Rs 13,126 per hectare in 2017–20. The Net Income 1 (NI1) followed the same trends across the periods. The period 2005–08 witnessed the highest NI1 at Rs 12,391 per hectare.

Table 8.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for mustard, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	14,998	5,737	8,028	12,495	9,260	6,970	2,503
2002–05	19,071	5,475	7,650	12,764	13,597	11,421	6,307
2005–08	20,020	5,623	7,629	12,839	14,398	12,391	7,181
2008–11	19,267	4,965	7,282	12,668	14,302	11,985	6,599
2011–14	20,295	5,887	8,852	14,419	14,407	11,443	5,876
2014–17	18,424	5,961	9,505	14,941	12,463	89,20	3,483
2017–20	20,365	7,240	10,593	16,278	13,126	9,773	4,088

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

Cost A2 for R&M decreased from 2000–02 to 2008–11 and then increased until 2017–20. Cost A2, at 2000–01 prices, was lowest for 2008–11 at Rs 4,965 per hectare. Cost A2 was highest in 2017–20 at Rs 7,240 per hectare. Cost A2+FL also declined from 2000–02 to 2008–11. After this, it increased for all the successive periods. Cost A2+FL, at constant prices, peaked in 2017–20 (Rs 10,593 per hectare). Real Cost C2 increased for the first three periods, and after a slight decrease during 2008–11, it increased again for all the successive periods. In almost all the years, the operational costs remained around 60 per cent of the total cost and the fixed cost comprised 40 per cent.

The CV for the measures of income shows an increased variation across the states over time, especially after 2013 (Figure A-6). However, the costs were increasing and converging across the states. This trend is opposite to that of the trend in income. The variability in profitability (particularly FBI profitability) has increased in recent years. Similarly, the variation across states for yields has also increased in the last decade.

Coming to state-specific features, West Bengal had the highest average real Cost A2 at Rs 7,868 per hectare, but it also had the lowest profitability at Cost A2 of 207 per cent. West Bengal also had the lowest FBI across states at Rs 8,295 per hectare. It is the only state which witnessed losses at Cost C2 in eight years during this 20-year period. Rajasthan had the lowest average Cost A2 at Rs 5,253 per hectare and the highest profitability at Cost A2 with an average of 380 per cent across years. Though Rajasthan had the highest profitability at Cost A2, Haryana has the highest average FBI at Rs 15,862 per hectare across all the periods. In terms of real Cost A2, Rajasthan and Madhya Pradesh were lower than the all-India average. West Bengal, Uttar Pradesh, and Haryana had higher Cost A2 than the all-India average. But in terms of real FBI, West Bengal and Uttar Pradesh had lower FBI than the all-India average across the states under consideration.

8.28.2 Cost Components and Prices

Machine labour cost comprised the majority of Cost A2 for R&M. The share of machine labour in Cost A2 increased from 24 per cent in 2000–02 to 31 per cent in 2017–20, except for 2014–17 where its share decreased by 1 percentage point compared to the preceding period. The share of casual human labour in Cost A2 has also increased from 14 per cent in 2000–02 to 20 per cent in 2017–20. The seed cost as a share of Cost A2 increased from 2 per cent in 2000–02 to 7 per cent in 2017–20. The share of fertilizer decreased from 19 per cent in 2000–02 to 14 per cent in 2014-20. The other component that was reduced is animal labour, which declined from 8 per cent in 2000–02 to just 1 per cent during 2017–20.

Human labour cost has remained a major share of the Cost A2+FL. The average across years was 46 per cent of the total share of Cost A2+FL. Family labour costs accounted for 73 per cent of the human labour cost within Cost A2+FL. The share of family labour in Cost A2+FL has decreased from 2000–02 to 2005–08, after which it increased for the next three periods. It declined by 5 per cent from 2014–17 to 2017–20. The share of animal labour, fertilizer and manure, and irrigation in Cost A2+FL also declined from 2000–02 to 2017–20 with some fluctuations across the periods.

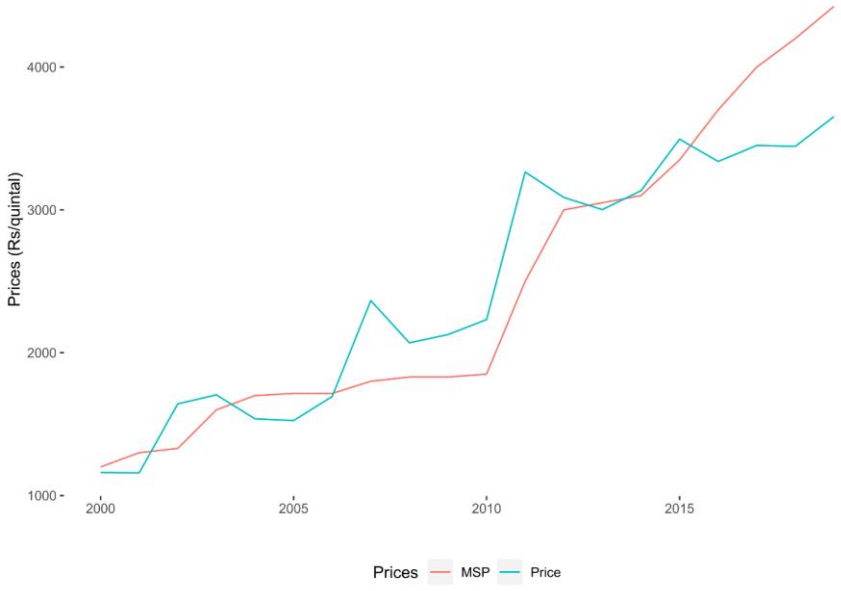
Comparison between states indicates that the share of machine labour in costs of cultivation (Cost A2 or A2+FL) varied widely. A few noteworthy observations are as follows. West Bengal has the least share of machine labour costs. The share of family labour in Cost A2+FL was highest for West Bengal. The share of irrigation cost in Cost A2 decreased substantially in Haryana from 26

per cent in 2000–02 to 12 per cent in 2017–20. Whereas the average irrigation cost share in Cost A2 across years has remained comparatively higher than the other states at 22 per cent.

The gap between the prices realised against the MSP has widened in recent years. The prices received by the farmers have been higher than the MSP during the years 2002–04, 2007–13, and 2014–16. For the rest of the years, the prices received by the farmers have been lower than that of MSP. The MSP has increased from Rs 3,700 per quintal in 2016–17 to Rs 4,425 per quintal in 2019–20. However, the prices realised remained well below Rs 3,650 per quintal for these periods.

The prices have been below MSP for all the states in recent years (Figure 8.2). The gap between the MSP and prices has varied widely across the states. The prices fell below the MSP after 2011–14 for almost all states, except for Uttar Pradesh. The gap between the prices realised and the MSP was highest during the 2017–20 period. The average shortfall between the MSP and prices realised was Rs 681 per quintal for all the five states under consideration. The highest gap was recorded for Madhya Pradesh at Rs 904 per quintal followed by Uttar Pradesh at Rs 856 per quintal, whereas Haryana had the lowest price gap at Rs 316 per quintal in 2017–20.

Figure 8.2 *Prices realised by farmers (implicit rate) and MSP for mustard, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

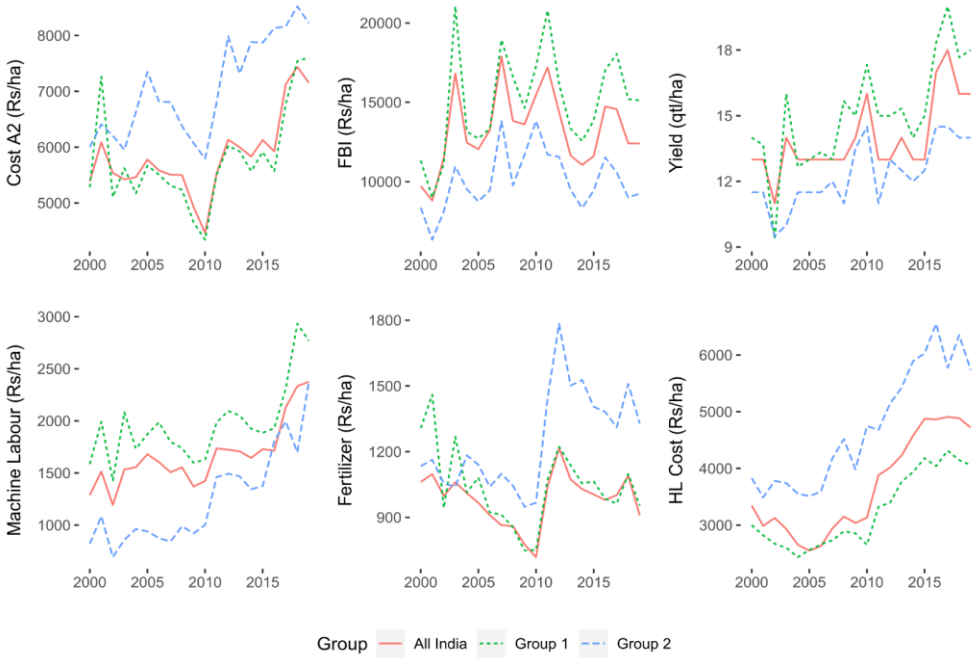
8.38.3 Yields and Input Use

The average yield of R&M was 14 quintals per hectare across the years. The all-India average yield increased from 13 quintals in 2000-02 to 17 quintals per hectare in 2017-20. Data from the crop production statistics show that yields increased from 9 quintals per hectare in 2000–01 to 13 quintals per hectare in 2019–20. The highest yield, at 18 quintals per hectare, was recorded in 2017-18. The lowest yield was recorded in 2002-03 at 11 quintals per hectare. In terms of input use, the average seed use remained at 6 kg per hectare across the years. Fertilizer use saw a marginal decline from 2000–02 (90 kg per hectare) to 2005–08 (85 kg per hectare). It increased substantially for successive periods. The average fertilizer use was 116 kg per hectare in 2017–20. Human labour use decreased from 407 hours per hectare in 2000–02 to 353 hours per hectare in 2005–08. After this decline, human labour use increased to 367 hours per hectare in the 2014–17 period and then declined to 346 hours per hectare in 2017–20.

There were large inter-state differences in yields and input use. The average yield for Haryana was 17 quintals per hectare. It was 11 quintals per hectare for West Bengal. Haryana had the highest decline in human labour use from 455 hours per hectare in 2000–02 to 202 hours per hectare in 2017–20. The average seed use was the lowest for Haryana (4 kg per hectare) and highest for West Bengal (8 kg per hectare). The human labour use for West Bengal was the highest, with it increasing in the initial periods and peaking at 735 hours per hectare in 2008–11. It declined consistently to 532 hours per hectare in 2017–20. Haryana had the highest average fertilizer use at 129 kg per hectare, followed by West Bengal at 128 kg per hectare across the years. The fertilizer use was lowest for Rajasthan at 84 kg per hectare. Animal labour use, though declined from 2000–01 to 2019–20, was most prevalent in West Bengal at an average of 78 hours per hectare. Despite the high input use, West Bengal had the lowest yields and the lowest FBI.

The movements in costs, incomes, yields, and input use show two groups of states — Group 1 with Haryana, Rajasthan, and Madhya Pradesh and Group 2 with Uttar Pradesh and West Bengal (Figure 8.3). Despite having higher costs per hectare partly on account of higher fertilizer and human labour costs, the yields and incomes have been lower in the Group 2 states.

Figure 8.3 *Costs, incomes, yields, and input use for mustard, all-India and groups of states, 2000–01to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Group 1 refers to Haryana, Rajasthan, and Madhya Pradesh, and Group 2 refers to Uttar Pradesh and West Bengal.

9 Groundnut

The CCPC covered 10 states to study groundnut in 2017–20. Around 2 per cent of households reported cultivation of groundnut in the kharif season in 2018–19 according to the Situation Assessment Survey (SAS) (Government of India 2021a). Groundnut cultivation constituted around 2.39 per cent (2018–19) of the total gross cultivated area in the country (Government of India 2022).

9.1 Profitability, Income, and Costs

The all-India average profitability at Cost A2 remained below 200 for most of the years. The average profitability at Cost A2 across the years was 177 per cent, ranging between 145 per cent and 217 per cent (Figure 9.1). The profitability at Cost A2, in terms of the three-year average, increased from 157 per cent in 2000–02 to 182 per cent in 2005–08. It declined to 179 per cent in 2008–11 and again increased to 190 per cent in 2011–14. The last two three-year periods, 2014–17 and 2017–20, witnessed a decline to 182 per cent and 165 per cent respectively. The profitability at Cost A2+FL followed similar trends and averaged 146 per cent across the years. The average profitability at Cost C2 was 106 per cent; and, it had been lower than 100 per cent for five years indicating net losses at Cost C2. For 2000–02, groundnut cultivation witnessed profitability at Cost C2 lower than 100 per cent (95 per cent).

Figure 9.1 *Profitability at Costs A2, A2+FL, and C2 for groundnut, all-India, 2000–01 to 2019–20* in per cent

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, the average FBI was Rs 9,356 per hectare across the years. The average FBI has increased from Rs 5,128 per hectare in 2000–02 to Rs 13,429 per hectare in 2011–14 (Table 9.1).

After this increase, the average FBI declined to Rs 11,533 per hectare in 2014–17 and Rs 9,317 per hectare in 2017–20. In terms of growth rate, the FBI increased by 50 per cent, 4 per cent, 13 per cent, and 49 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, 2005–08 to 2008–11, and 2008–11 to 2011–14 respectively. After these periods of growth, the FBI witnessed negative growths at -14 per cent and -19 per cent from 2011–14 to 2014–17 and 2014–17 to 2017–20. The average NI1 across the years was Rs 6,746 per hectare and it followed a similar pattern to that of the FBI. The NI2 was negative for 2000–02 at Rs -707 per hectare.

Table 9.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for groundnut, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	14,076	8,947	10,985	14,782	5,128	3,091	-707
2002–05	17,561	9,856	11,795	16,294	7,704	5,766	1,267
2005–08	17,577	9,595	11,542	16,049	7,981	6,035	1,528
2008–11	20,211	11,220	13,717	18,901	8,992	6,494	1,311
2011–14	28,062	14,633	17,988	25,116	13,429	10,074	2,947
2014–17	26,013	14,480	17,664	23,657	11,533	8,348	2,356
2017–20	23,616	14,299	17,418	22,996	9,317	6,198	620

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The real average Cost A2 was Rs 12,007 per hectare across the years. It ranged between Rs 8,433 per hectare and Rs 15,160 per hectare. In terms of growth rates, Cost A2 has increased by 10 per cent from 2000–02 to 2002–05 and witnessed a negative growth rate of -3 per cent from 2002–05 to 2005–08. It again grew at a rate of 17 per cent and 30 per cent from 2005–08 to 2008–11 and 2008–11 to 2011–14. After this steep growth in Cost A2, the growth rates fell to -1 per cent for 2011–14 to 2014–17 and 2014–17 and 2017–20 periods. Similar trends in growth rates were followed by Cost A2+FL and Cost C2. The Cost A2+FL and C2 peaked during 2011–14 at Rs 25,116 per hectare and Rs 28,062 per hectare respectively.

The CV across all states shows that there were low variations in the first decade and divergence in the second decade for incomes (Figure A-7). CV for Costs A2 and A2+FL also followed a similar trend across the years. The variability across states for profitability measures has not changed much in the last two decades, while variability in yields has reduced slightly in the last decade.

While analysing trends for various states, we see a stark gap between the profitability, costs, and incomes across the states. The average profitability at Cost A2 for Gujarat (202 per cent) was higher than the all-India average whereas, Maharashtra, Andhra Pradesh, Tamil Nadu, and Karnataka had lower profitability at Cost A2 than the all-India average. In the case of the real FBI, a similar pattern can be seen with Gujarat having a higher real FBI than the all-India average. All other states had real FBI lower than the all-India average. In terms of real Cost A2, Gujarat, Maharashtra, and Tamil Nadu had higher costs than the all-India average. Andhra Pradesh and Karnataka had lower real Cost A2 than the all-India average.

9.2 Cost Components and Prices

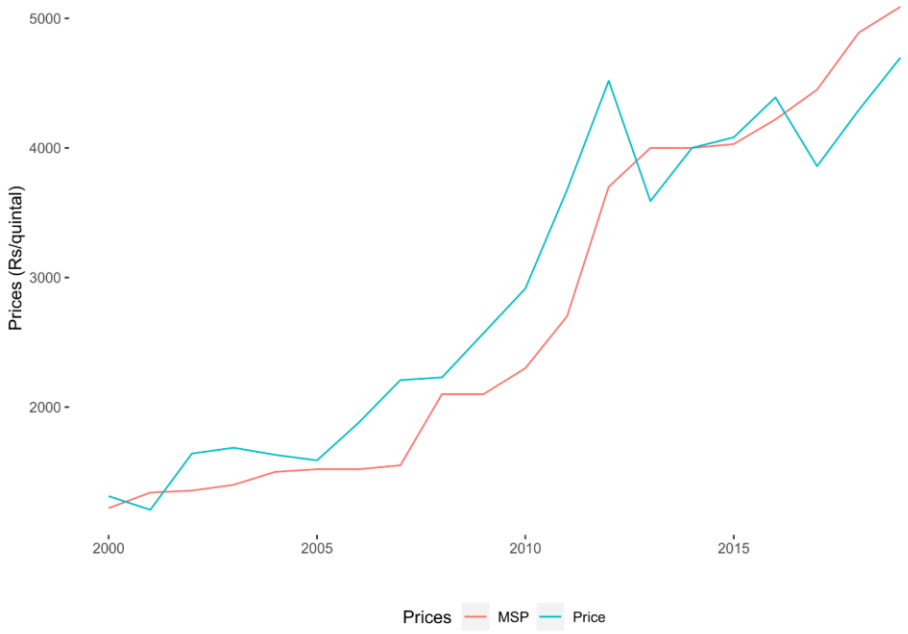
Seed cost, human labour cost, and fertilizer and manure cost constituted a major share (about two-thirds) of Cost A2. The average share of seed cost in Cost A2 was 27 per cent, ranging between 25 per cent and 30 per cent across the years. The second major share in Cost A2 was human labour cost with an average 26 per cent share. In terms of the three-year average, the human labour cost share remained between 22 per cent and 30 per cent. The average human labour cost share has declined from 30 per cent in 2011–14 to 24 per cent in 2017–20. The average fertilizer and manure cost share in Cost A2 was 13 per cent across the years. The average machine labour cost share (10 per cent) has increased from 7 per cent in 2000–02 to 16 per cent in 2017–20. The average animal labour cost share has declined across the years from 15 per cent in 2000–02 to 7 per cent in 2017–20. The average share of family labour cost in Cost A2+FL was 18 per cent across the years. The human labour cost share constituted the major share in Cost A2+FL followed by seed cost share and fertilizer and manure cost share.

The human labour cost share in Cost A2 for Andhra Pradesh (31 per cent) and Tamil Nadu (36 per cent) was higher than the all-India average whereas it was the least for Gujarat at 18 per cent. The seed cost share in Cost A2 for Andhra Pradesh (29 per cent), Gujarat (28 per cent), and Karnataka (31 per cent) was higher than the all-India average. The average seed cost share in Cost A2 was lower than the all-India average for Maharashtra (21 per cent) and Tamil Nadu (23 per cent). Family labour cost share in Cost A2+FL was higher than the all-India average for Maharashtra and Tamil Nadu at 21 per cent.

The prices realised by the farmers at an all-India level, fell below the MSP in recent years (Figure 9.2). The prices remained above the MSP till 2016–17, except for 2001–02 and 2013–14 when the

prices were below the MSP. After falling below the MSP in 2017–18, the prices remained below them for 2018–19 and 2019–20. The prices, at current prices, touched a high of Rs 4,679 per quintal in 2019–20. In real terms, the average prices were Rs 1,327 per quintal, ranging between Rs 1,147 per quintal and Rs 1,528 per quintal. The state-specific trends show that the states like Andhra Pradesh, Karnataka, and Maharashtra had higher prices than the MSP for more years than the all-India average; however, for Tamil Nadu and Gujarat, the prices realised were lower than the MSP for more years. In real terms, the prices realised were higher than the all-India average only for Gujarat.

Figure 9.2 *Prices realised by farmers (implicit rate) and MSP for groundnut, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

9.3 Yield and Input Use

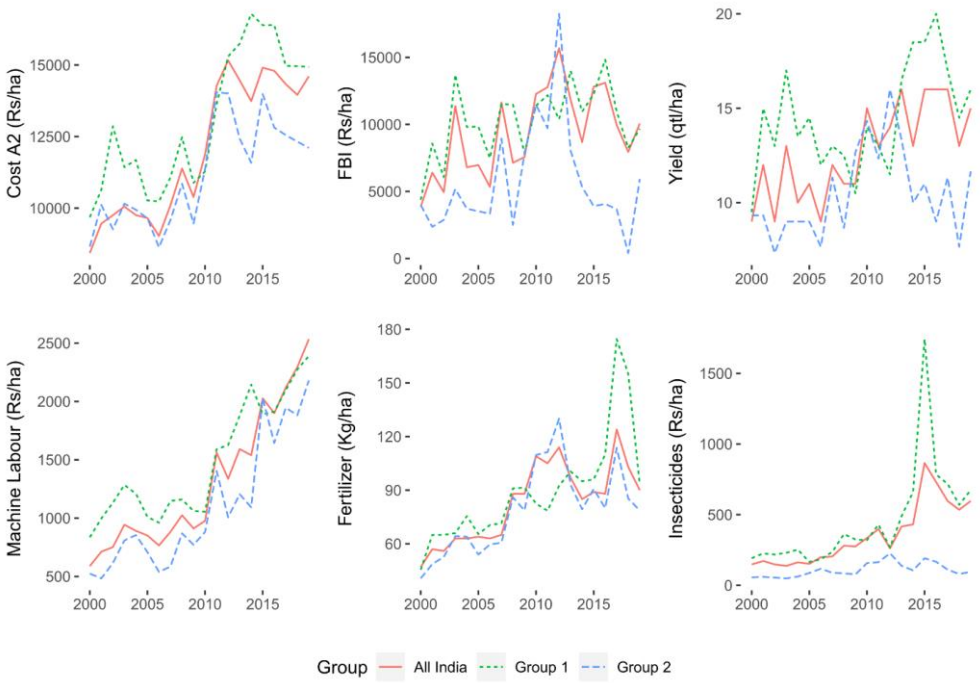
The average yield from groundnut at an all-India level was 13 quintals per hectare. The average yield has increased across the three-year periods from 11 quintals per hectare in 2000–02 to 15 quintals per hectare in 2017–20. According to the crop production statistics, yields increased from 10 quintals per hectare in 2000–01 to 20 quintals per hectare in 2019–20. The average seed use has increased overtime from 98 kg per hectare in 2000–02 to 133 kg per hectare in 2017–20. The average fertilizer use has also increased from 52 kg per hectare in 2000–02 to 106 kg per hectare in 2017–20, except for a decline during 2014–17. The average manure use remained around 22 quintals per hectare across the years. The average human labour use has witnessed an overall

decrease with some fluctuations over the years. Human labour use peaked during 2011–14 at 665 hours per hectare and then declined to 517 quintals per hectare. The average animal labour use has declined from 63 hours per hectare in 2000–02 to 19 hours per hectare in 2017–20.

The yields varied across states with Karnataka being the least productive state, with an average yield of 7 quintals per hectare. The yield for other states remained above the all-India average of 11 quintals per hectare. The seed use was highest for the state of Gujarat; it increased from 101 kg per hectare in 2000–02 to 150 kg per hectare in 2017–20. It was least for Maharashtra with an average use of 88 kg per hectare, ranging between 79 kg per hectare and 96 kg per hectare. On the other hand, the increase in average fertilizer use was highest for Tamil Nadu. It increased from 54 kg per hectare in 2000–02 to 177 kg per hectare in 2017–20. The average human labour use was highest for Maharashtra, at 932 hours per hectare, though it declined over the years.

The group-wise analysis for costs, incomes, and yield shows when there was convergence in the costs and yields during the early 2010s (Figure 9.3). The yield for group 1 — Gujarat and Tamil Nadu — was higher than that of group 2 — Andhra Pradesh, Karnataka, and Maharashtra — in the initial decade and converged near the 2010s. The gap widened after 2013 with the yields of Group 1 increasing and that of Group 2 decreasing. The average Cost A2 and FBI have been diverging for both the groups, with Group 2 recording a much lower FBI in the 2010s. The fertilizer use and the machine labour costs increased for both groups. The insecticide cost was higher and it increased across the years for Group 1 while it remained lower for Group 2.

Figure 9.3 *Costs, incomes, yields, and input use for groundnut, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Group 1 refers to Gujarat and Tamil Nadu and Group 2 refers to Andhra Pradesh, Karnataka, and Maharashtra.

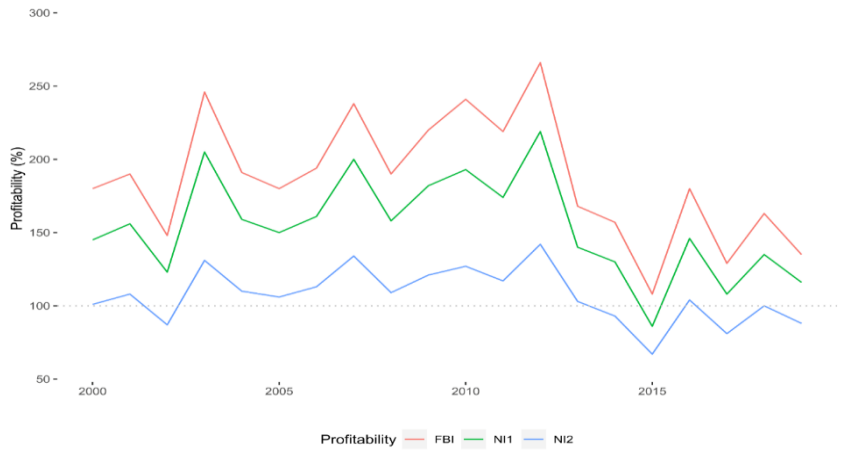
10 Soybean

Soybean is a major oilseed crop and the CCPC Scheme reported estimates for six states in 2017–20. According to the SAS report 2021, about 6 per cent of agricultural households reported soybean cultivation during the kharif season in 2018-19 (Government of India 2021a).

10.1 Profitability, Income, and Costs

The average all-India profitability at Cost A2 for soybean was 187 per cent across the years. It was highest during 2012-13 at 266 per cent and lowest in 2015-16 at 108 per cent (Figure 10.1). The three-year average shows an increasing trend in profitability at Cost A2 from 185 per cent in 2000–02 to 218 per cent in 2011–14. The profitability at Cost A2 witnessed a steep fall of 70 percentage points to 148 per cent during 2014–17. It decreased from this to 142 per cent in 2017–20. Profitability at Cost A2+FL followed a similar trend throughout and it averaged 154 per cent across the years while ranging between 86 per cent and 219 per cent. The profitability at Cost A2+FL slipped below 100 per cent during 2015-16. The average profitability at Cost C2 remained below 100 per cent for the last two three-year periods, that is, 2014–17 and 2017–20. This points out that an average farmer faced losses when imputed costs were added during these two periods.

Figure 10.1 *Profitability at Costs A2, A2+FL, and C2 for soybean, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, the FBI from the soybean cultivation remained below Rs 10,000 per hectare, except for 2012–13, and it decreased even further below Rs 5,000 per hectare after 2014–15. The three-year average shows an increase in the FBI from Rs 4,736 per hectare to Rs 8,322 per hectare till 2011–14, which then declined to Rs 3,488 per hectare in 2017–20 (Table 10.2). The NI2 was negative during 2014–17 and 2017–20, indicating net losses at Cost C2. In terms of growth rates,

the FBI has increased by 23 per cent, 12 per cent, 15 per cent, and 10 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, 2005–08 to 2008–11, and 2008–11 to 2011–14 respectively. After this, the FBI has witnessed a negative growth rate of -54 per cent and -9 per cent during 2011–14 to 2014–17 and from 2014–17 to 2017–20.

Table 10.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for soybean, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	10,544	5,808	7,041	10,053	4,736	3,503	491
2002–05	12,408	6,587	7,754	11,310	5,821	4,654	1,097
2005–08	13,291	6,746	7,910	11,299	6,546	5,381	1,992
2008–11	14,768	7,213	8,599	12,528	7,555	6,169	2,240
2011–14	15,883	7,561	9,085	13,073	8,322	6,799	2,810
2014–17	12,366	8,569	10,365	14,037	3,797	2,001	-1,671
2017–20	11,950	8,502	9,962	13,243	3,448	1,989	-1,293

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, the Cost A2 has averaged Rs 7,357 per hectare across the years and it peaked in 2016-17 at Rs 8,934 per hectare. The three-year periods show an increase from Rs 5,808 per hectare in 2000–02 to Rs 8,569 per hectare till 2014–17 after which we witnessed a marginal decline to Rs 8,502 per hectare in 2017–20. Cost A2+FL and C2 followed similar trends across the three-year periods. In terms of growth rate, the Cost A2 increased at a rate of 13 per cent, 2 per cent, 7 per cent, 5 per cent, and 13 per cent from 2000–02 to 2002–05, 2002–05 to 2005–08, 2005–08 to 2008–11, and 2008–11 to 2011–14, and 2011–14 to 2014–17 respectively. And, from 2014–17 to 2017–20 the Cost A2 declined by 1 per cent.

The CV for the measures of income (FBI and NI1) across the states shows an increase in the variation over time (Figure A-8). The variability in costs has reduced in the last decade. Although the variability in incomes has increased over the last 10 years, the variability in profitability and yields have not changed much in this period.

The profitability at Cost A2 from soybean cultivation was highest for the state of Rajasthan at 218 per cent, followed by Madhya Pradesh (210 per cent) and Maharashtra (151 per cent). Madhya Pradesh had the highest average FBI at Rs 6,471 per hectare across the years. Madhya Pradesh has also witnessed high fluctuations in the FBI across the years and the range of FBI was between Rs -809 per hectare and Rs 13,086 per hectare. Maharashtra had the least average FBI (Rs 4,800 per hectare) across the years. The NI2 for Maharashtra was negative for 10 years, indicating the negative net returns at Cost C2. The cost of cultivation for the states also differed widely. The state of Maharashtra had the highest average Cost A2 at Rs 9,554 per hectare followed by Madhya Pradesh (Rs 6,717 per hectare) and Rajasthan (Rs 5,217 per hectare) across the years.

10.2 Cost Components and Prices

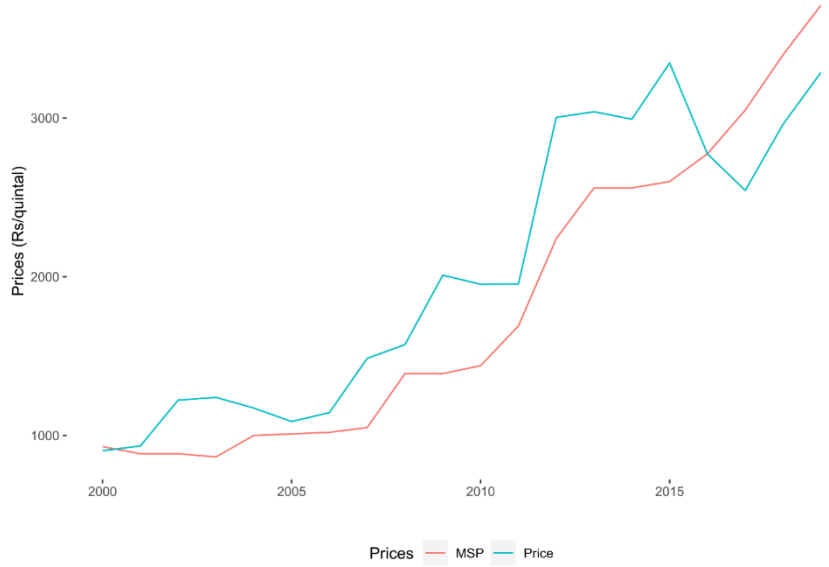
The machine labour cost share in Cost A2 has increased over the years from 17 per cent in 2000–01 to 27 per cent in 2019–20. The share of human labour cost averaged 20 per cent across the years and it ranged between 16 per cent and 23 per cent. The seed cost share in Cost A2 contributed around 19 per cent across the years, ranging between 15 per cent and 24 per cent. The fertilizer and manure cost share remained around 13 per cent, with slight fluctuations across the years. Animal labour cost share has declined across the years from 23 per cent in 2000–01 to 6 per cent in 2019–20. The irrigation cost for the crop remained below 3 per cent across the years. While looking at the cost components share for Cost A2+FL, the average human labour cost share was 33 per cent across the years and the share of other components reduced accordingly.

The state-specific cost structures were different. The average share of human labour cost in Cost A2 was highest for Maharashtra (23 per cent) and the least for Madhya Pradesh. The average machine labour cost share for Rajasthan was the highest (26 per cent) followed by Madhya Pradesh (22 per cent) and Maharashtra (17 per cent) across the years. In terms of share family labour cost in Cost A2+FL, Rajasthan had the highest share at 26 per cent across the years followed by Madhya Pradesh (19 per cent) and Maharashtra (10 per cent)

The prices realised fell below the MSP announced by the Government of India after 2015-16. The prices realised were higher than the MSP till 2015–16, except for 2000–01. The gap between the prices and MSP kept on increasing and decreasing during these years but the prices never fell below the MSP. The prices fell below MSP in 2016–17 and remained so till 2019–20. The current values of prices touched a high of Rs 3,347 per quintal in 2015–16. In real terms, the average prices were Rs 1,045 per quintal, ranging between Rs 866 per quintal and Rs 1,320 per quintal.

The prices realised by the states followed the all-India level trends and dropped below the MSP after 2015–16 (Figure 10.2). The prices for Rajasthan, though remained below MSP, converged towards the MSP in recent years. The gap between the MSP and prices realised in recent years was highest for the state of Madhya Pradesh at around Rs 600 per quintal.

Figure 10.2 *Prices realised by farmers (implicit rate) and MSP for soybean, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

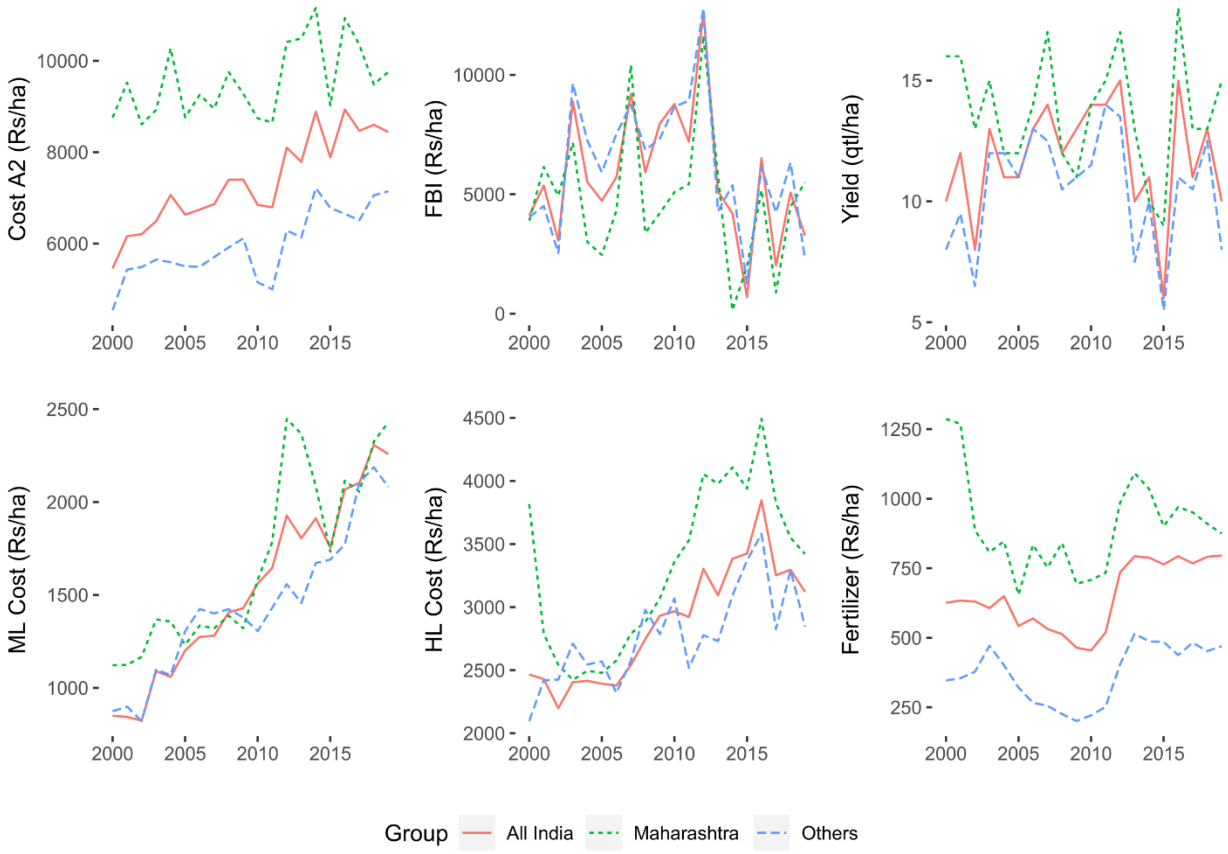
10.3 Yield and Input Use

The all-India average yield was 11 quintals per hectare in 2000-02 and 2017-20, after reaching the peak level of 13 quintals per hectare in the mid-2000s and the early 2010s. According to the crop-production statistics, the yields remained between 7 quintals per hectare and 13 quintals per hectare at all-India levels across the years. It increased from 8 quintals per hectare in 2000–01 to 9 quintals per hectare in 2019–20, indicating a period of fluctuations and a trend of general stagnation. The average seed use was 87 kg per hectare, with slight fluctuations across the years. The average fertilizer use, however, has increased from 45 kg per hectare in 2000–02 to 62 kg per hectare in 2017–20. The average animal labour use has decreased from 53 hours per hectare in 2000–02 to 15 hours per hectare. The average human labour use has also decreased from 394 hours per hectare in 2000–02 to 281 hours per hectare in 2017–20. The average manure use for the crop was about 6 quintals per hectare.

Maharashtra had the highest average yield of 14 quintals per hectare followed by Madhya Pradesh (11 quintals per hectare) and Rajasthan (10 quintals per hectare). The input use also varied across the states. Human labour use and animal labour use, though declined, were highest for Maharashtra. The average seed use was highest for Rajasthan, and it increased from 90 kg per hectare in 2000–02 to 119 kg per hectare in 2017–20. For Maharashtra and Madhya Pradesh, the seed use remained similar across the years and not much variation was observed. The average fertilizer use was highest for Maharashtra at around 76 kg per hectare and it was least for Rajasthan at about 11 kg per hectare.

The group-level analysis shows that despite the higher costs and higher yields for Maharashtra, the FBI remained below the all-India average and the other states for several years (Figure 10.3). Maharashtra had higher fertilizer costs, machine labour costs, and human labour costs for most of the years than other states — Madhya Pradesh and Rajasthan. The fertilizer cost had decreased in the first decade and increased again in the early second decade after which it declined marginally in the last five years. The other states — Rajasthan and Madhya Pradesh — which had the lower Cost A2 along with the low input costs and lower yields had higher FBI, probably owing to the higher prices realised by these states for their produce.

Figure 10.3 *Costs, incomes, yields, and input use for soybean, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Others refer to Madhya Pradesh and Rajasthan.

The CCPC Scheme covered three states in the recent 2017–20 cycle to study incomes and costs from sunflower cultivation.

11.1 Profitability, Income, and Costs

The all-India average profitability at Cost A2 of sunflower varied widely across the years. The range of the profitability at Cost A2 was between 95 per cent and 247 per cent, while the average across years was 152 per cent. The lowest profitability at Cost A2 was witnessed in the year 2015–16 at 95 per cent, indicating average loss for the farmers even at Cost A2 (Figure 11.1). Whereas 2016-17 witnessed the highest profitability from sunflower cultivation at 247 per cent. The three-year average shows an increase in profitability at Cost A2 from 124 per cent in 2000–02 to 181 per cent in 2005–08, after which the profitability again declined to 136 per cent in 2008–11. The profitability at Cost A2 increased to 160 per cent in 2011–14 and 169 per cent in 2014–17. It declined to 145 per cent in the 2017–20 period. The profitability at Cost C2 was less than 100 per cent for most of the years. Except for the three years of 2005–08, the average profitability was less than 100 per cent for the three-year periods (six out of seven periods). This indicates that the farmers had faced persistent losses at Cost C2.

Figure 11.1 *Profitability at Costs A2, A2+FL, and C2 for sunflower, all-India, 2000–01 to 2019–20* in per cent

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The real FBI from sunflower cultivation averaged Rs 2,970 per hectare across the years and it witnessed high fluctuations across the years. The highest real FBI was recorded for the year 2016–17 at Rs 7,702 per hectare, whereas it was lowest in 2015–16 at Rs -218 per hectare. The three-

year period average shows an increase in the first three periods from Rs 1,275 in 2000–02 to Rs 3,887 per hectare in 2005–08 (Table 11.1). The real FBI then declined to Rs 2,283 in 2008–11. It increased to Rs 3,891 in 2011–14. After this, it has consistently declined in the next two three-year periods to Rs 2,682 per hectare in 2017–20. The average real NI2 across the years was Rs -612 per hectare. The average NI2 was more than Rs 1,000 per hectare for 4 three-year periods. And, only one three-year period, 2005–08, has positive NI2.

Table 11.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for sunflower, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	6,752	5,477	6,422	8,369	1,275	330	-1,617
2002–05	8,202	5,906	6,896	9,395	2,296	1,305	-1,193
2005–08	8,821	4,933	5,732	8,090	3,887	3,089	731
2008–11	8,276	5,993	6,986	9,315	2,283	1,290	-1,039
2011–14	10,065	6,174	7,460	10,185	3,891	2,604	-120
2014–17	9,983	6,137	7,353	10,444	3,846	2,630	-461
2017–20	8,884	6,202	7,546	10,204	2,682	1,339	-1,319

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

In real terms, Cost A2 had averaged Rs 5,850 per hectare and it has increased over the years. It has increased across the three-year periods from Rs 5,477 per hectare in 2000–02 to Rs 6,202 per hectare in 2017–20, with some decrease in 2005–08 and 2014–17. There was a decline of almost Rs 1,000 per hectare in 2005–08. Whereas the decline was marginal (Rs 37 per hectare) in 2014–17. Similar trends were observed in Cost A2+FL which also has increased across periods. In the case of Cost C2, it peaked during 2014–17 at Rs 10,444 and it declined to 10,204 during 2017–20.

For Karnataka, the only state for which we have data for 20 years, the profitability was just higher than the all-India average at 153 per cent across years. The profitability at Cost A2 for the state ranged between 92 per cent and 253 per cent. Despite the high profitability at Cost A2, the state witnessed lower FBI (Rs 2,542 per hectare) than the all-India average. The year 2015-16 witnessed a negative FBI. The NI2 was negative for 12 years out of the 20 years pointing towards the distress in sunflower cultivation. If we consider the three-year period average, the NI2 was negative for five periods, except for 2005–08 and 2014–17. The cost of cultivation has increased for the state

over the years. The average real Cost A2 was Rs 4,877 per hectare was lower than the all-India average.

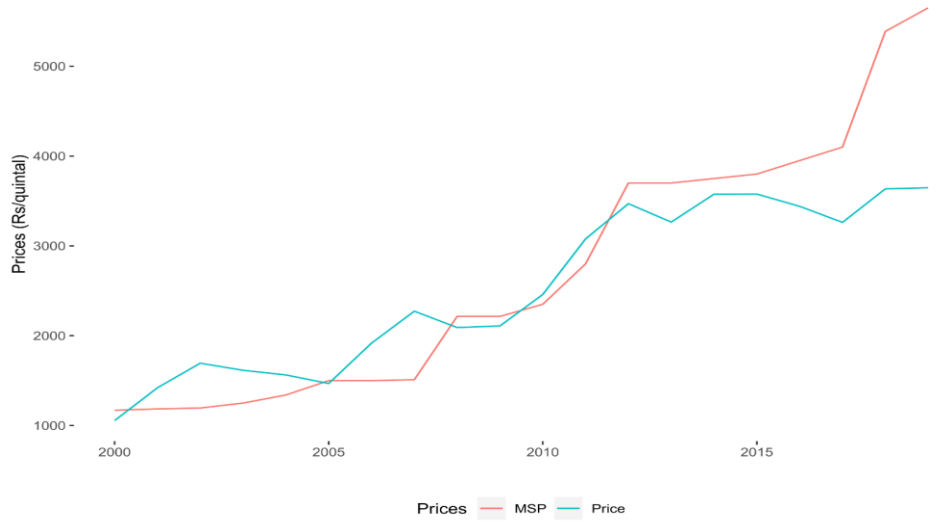
11.2 Cost Components and Prices

For sunflower cultivation, the human labour cost and the machine labour cost constituted a major share of Cost A2. The share of human labour cost has increased by almost 9 per cent from 20 per cent in 2000–02 to 29 per cent in 2017–20. Similarly, the machine labour cost has increased by almost 13 per cent from 8 per cent in 2000–02 to 21 per cent in 2017–20. The share of fertilizers cost had remained around 14 per cent across the years. On the other hand, the share of animal labour cost in Cost A2 has declined from 28 per cent to 14 per cent across the three-year periods. The average share of seed cost remained at 14 per cent across the years. The share of seed cost had increased in the initial years to 17 per cent but again gradually decreased to 14 per cent. The fertilizer cost share also remained at 11-15 per cent across the three-year periods with an average share of 14 per cent.

Karnataka, which had the lower Cost A2 and A2+FL, had the highest share of human labour cost in Cost A2 in recent years. In the earlier years or three-year periods, animal labour cost constituted a major share of the Cost A2. The human labour cost along with the machine labour cost had increased across the three-year periods by 8 per cent and 13 per cent respectively. The animal labour cost share has declined by almost 13 per cent from 27 per cent in 2000–02 to 14 per cent in 2017–20. Fertilizer and manure cost share has also declined marginally by 4 per cent across the three-year periods. The increase in the share of human labour cost and machine can be attributed to the stark decline in animal labour cost and increased mechanisation during these years. While looking at Cost A2+FL, the human labour share increased from 30 per cent during 2000–02 to 40 per cent in 2017–20. Out of the total human labour cost, almost 40 per cent was constituted by family labour.

The prices realised by the farmers from the sunflower cultivation kept on moving with the MSP till 2012–13 (Figure 11.2). And, since then the prices realised stagnated whereas the MSP has increased over the years. The gap between the two has widened even more in recent years. The MSP has reached around Rs 5,600 per quintal, but the prices realised are still around Rs 3,600 per quintal in 2019–20, a gap of almost Rs 2,000 per quintal. These trends remained the same for the state of Karnataka. The prices realised were higher than the MSP for some years in the first decade whereas, in the second decade, the gap widened between the two.

Figure 11.2 *Prices realised by farmers (implicit rate) and MSP for sunflower, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

11.3 Yield and Input Use

The average all-India yield of sunflower increased from 6 quintals per hectare in 2000-02 to 8 quintals per hectare in 2017-20. The data from the crop production statistics show that yields increased from 6 quintals per hectare in 2000–01 to 9 quintals per hectare in 2019–20. The three-year average trends show stagnancy in the yields for the initial five three-year periods, as it remained at 6 quintals per hectare. The yield increased to 8 quintals per hectare in 2014–17 and remained at the same level in 2017–20.

At the all-India level, the average human labour use was 341 hours per hectare across the years. The periodic average shows a decline in human labour use from 381 hours per hectare in 2002–05 to 297 hours per hectare in 2014–17 after which the human labour use again increased to 326 hours per hectare in 2017–20. The fertilizer use has increased from 57 kg per hectare in 2000–02 to 70 kg per hectare in 2017–20. Though fertilizer use has decreased in the last three-year period from 74 kg per hectare in 2014–17 to 70 kg per hectare in 2017–20. Seed use decreased from 7 kg per hectare to 6 kg per hectare in 2002–05 and remained the same till 2014–17. In 2017–20 the seed use has increased to 9 kg per hectare. Animal labour use decreased from 72 hours per hectare in 2000–02 to 23 hours per hectare in 2017–20.

Karnataka has witnessed lower average yields for almost four three-year periods than the all-India average. It decreased from 6 quintals per hectare in 2000–02 to 4 quintals per hectare in 2002–05.

It fluctuated between 4 quintals per hectare and 5 quintals per hectare till 2011–14 after which the yield increased to 8 quintals per hectare in the 2014–17 and 2017–20 periods. The state had a lower average of human labour use (313 hours per hectare) than the all-India average. Human labour use has seen an increase from 301 hours per hectare in 2000–02 to 374 hours per hectare in 2002–05. After this increase, human labour use declined to 238 hours per hectare during 2011–14. It again increased to 313 hours per hectare in 2017–20. The average seed remained at almost 1 kilogram per hectare across the periods.

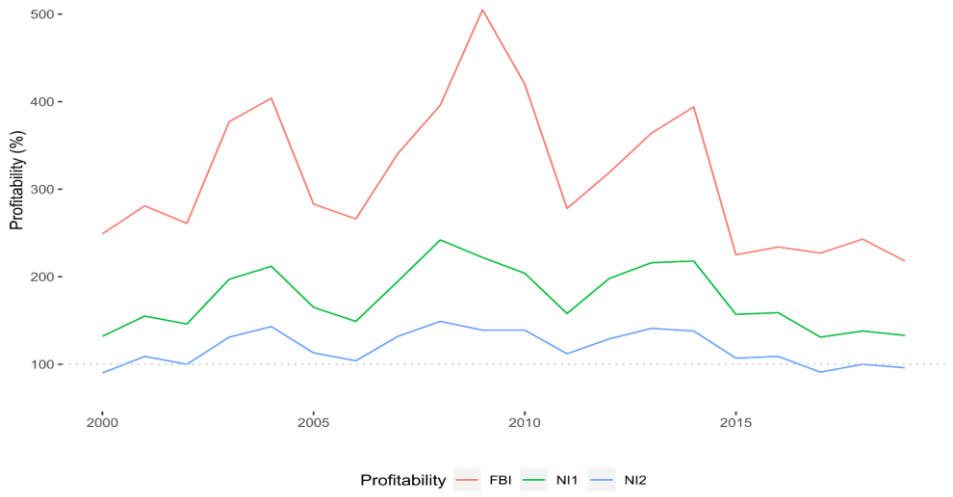
12 Sesamum

The CCPC Scheme studied nine states to estimate the cost of cultivation for sesamum in the recent 2017–20 cycle. Sesamum cultivation accounted for 0.84 per cent of the total cultivated area during the kharif season in 2018-19 (Government of India 2021a).

12.112.1 Profitability, Income, and Costs

The all-India average profitability measures (at all levels of Costs) for sesamum have declined to its lowest levels in the last five years. The profitability measures witnessed three peaks in 2004-05, 2009-10, and 2014-15 (Figure 12.1). The profitability at Cost A2 peaked in 2009-10 at 505 per cent. The average profitability at Cost A2 from the crop was 314 per cent across the years ranging between 218 per cent and 505 per cent. The three-year average shows a continuous decline in profitability at Cost A2 from 440 per cent in the 2008–11 period to 229 per cent in 2017–20, a decline of almost 200 per cent points in the last 3 three-year periods. The profitability at Cost A2+FL remained much lower than the profitability at Cost A2. It averaged 175 per cent across the years. It has also declined from 223 per cent in 2008–11 to 134 per cent in 2017–20. The average profitability at Cost C2 fell below 100 per cent in the first and the last three-year period, that is, 2000–02 and 2017–20, indicating losses from crop production.

Figure 12.1 *Profitability at Costs A2, A2+FL, and C2 for sesamum, all-India, 2000–01 to 2019–20* in per cent



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The FBI in real terms averaged Rs 6,360 per hectare across the years and it was highest for the year 2013–14 at Rs 10,191 per hectare. The real average FBI has witnessed an increase from Rs 3,637 per hectare to Rs 8,188 per hectare in 2011–14, an increase of almost 125 per cent, with a

marginal decline during 2005–08 (Table 12.1). The FBI has been in decline since 2011–14. It declined from Rs 8,188 in 2011–14 to Rs 5,517 per hectare in 2017–20. In terms of growth rates, the FBI increased by 59 per cent from 2000–02 to 2002–05. It grew at -5 per cent from 2002–05 to 2005–08. It increased by 42 per cent and 5 per cent from 2005–08 to 2008–11 and 2008–11 to 2011–14 respectively. The next two three-year periods witnessed a negative growth rate of -12 per cent and -24 per cent from 2011–14 to 2014–17, and 2014–17 to 2017–20 respectively. The NI1 and NI2 also followed a similar trend, increasing in the first five three-year periods and then decreasing in the last two three-year periods. The real average NI2 was negative for 2000–02 and 2017–20 indicating net losses from sesamum cultivation.

Table 12.1 *Average gross value of output (GVO), Costs A2, A2+FL, and C2, farm business income (FBI), net income 1 (NI1), and net income 2 (NI2) for sesamum, all-India, 2000–02 to 2017–20* in Rupees per hectare constant prices (base = 2000–01)

Period	GVO	A2	A2+FL	C2	FBI	NI 1	NI 2
2000–02	6,362	2,725	4,443	6,455	3,637	1,919	-92
2002–05	8,653	2,884	4,719	6,936	5,769	3,934	1,717
2005–08	8,884	3,386	5,351	7,654	5,498	3,533	1,230
2008–11	11,135	3,346	5,410	8,196	7,789	5,725	2,939
2011–14	12,533	4,345	6,741	9,793	8,188	5,793	2,740
2014–17	12,117	4,903	7,149	10,347	7,214	4,968	1,770
2017–20	10,481	4,964	7,904	10,782	5,517	2,577	-301

Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.

The real cost of cultivation has increased over the years. The average real Cost A2 was Rs 3,847 per hectare across the years. The three-year period average shows an increase across all seven periods. It increased from Rs 2,725 per hectare in 2000–02 to Rs 4,964 per hectare in 2017–20, an increase of almost 82 per cent across the three-year periods. The Cost A2+FL and C2 also followed similar trends as of Cost A2 and increased over the three-year periods. In terms of growth rates, Cost A2 grew by 6 per cent and 13 per cent from 2000–02 to 2002–05 and 2002–05 to 2005–08 respectively. It declined by 1 per cent from 2005–08 to 2008–11, after which it again increased by 30 per cent, 13 per cent, and 1 per cent from 2008–11 to 2011–14, 2011–14 to 2014–17, and 2014–17 to 2017–20 respectively.

The CV for the measures of income across the states shows an increased variation over time. The CV for the measures of cost across the states shows a decreasing trend in the first decade, followed by an increase in the variation in the second decade (Figure A-10). The trends are similar for variability across states for profitability (except for FBI Profitability, which shows a reduction in variability in the last decade) and yields.

In terms of state-specific features, Rajasthan had the highest profitability at Cost A2, and Odisha had the lowest. Odisha and Gujarat had profitability at Cost A2 lower than the all-India average. The average real FBI from the sesamum cultivation was highest in Gujarat. It was the lowest for Odisha, like profitability at Cost A2. The real FBI for Odisha and Rajasthan were below the all-India average. The average real FBI for Gujarat has increased over the three-year periods from Rs 3,695 per hectare in 2000–02 to Rs 12,753 per hectare in 2017–20 whereas the increase in real FBI for Rajasthan and Odisha was marginal with high fluctuations across the three-year periods. It has also been observed that there has been a substantial decline in the real FBI during 2017–20. The cost of cultivation for sesamum also varied widely across the states. Gujarat had the highest average real Cost A2 at about Rs 5,900 per hectare (averaged across periods). The real Cost A2 for the state has increased over the years. For Odisha and Rajasthan, the average real Cost A2 was below Rs 2,500 per hectare. GVO for the crop has varied widely across the states with Gujarat having the highest real GVO and Rajasthan having the lowest real GVO across the years.

12.2 Cost Components and Prices

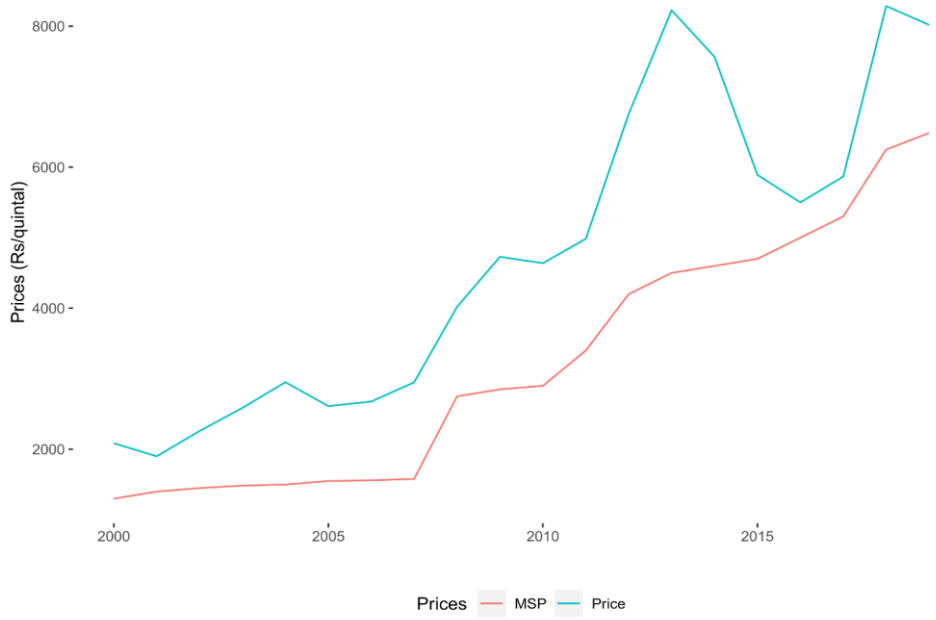
In real terms, the Cost A2 remained below Rs 5,000 per hectare. And, out of this, the share of human labour cost and machine labour cost has increased from 48 per cent in 2000–02 to 66 per cent in 2017–20. The increase in human labour cost share was about 13 per cent from 28 per cent in 2000–02 to 41 per cent in 2017–20. The share of animal labour cost in Cost A2 had declined from 17 per cent in 2000–02 to 3 per cent in 2014–17 and increased marginally to 5 per cent in 2017–20. The share of fertilizer cost in Cost A2 averaged around 10 per cent across the years. In 2017–20, the share of fertilizer cost in Cost A2 came down to 6 per cent from 12 per cent in 2014–17. The average share of seed cost remained between 5 per cent and 7 per cent across the three-year periods. The average share of human labour cost and machine labour cost in Cost A2+FL was around 70 per cent across the years. The share of other cost components remained well below 10 per cent and these contributed marginally to Cost A2+FL.

The state-specific trends point towards stark differences between various cost components. The increase in the average share of human labour cost in Cost A2 was highest for Rajasthan from 17 per cent in 2000–02 to 50 per cent in 2017–20. It was the least for Gujarat from 27 per cent in 2000–02 to 34 per cent in 2017–20 with some decline in 2002–05, 2005–08, and 2014–17. The machine labour cost share in Cost A2 was highest for Rajasthan whereas it was lowest for Odisha. There was a decline in animal labour cost share in Cost A2 for all the states; however, for Odisha, its share remained over 10 per cent. The fertilizer cost share was the highest for Gujarat and constituted about 15 per cent share in Cost A2 across the years. Human labour cost share in Cost A2+FL was highest for Rajasthan and when combined with the machine labour cost, these constituted around 80 per cent of the Cost A2+FL.

The prices realised (implicit rates), in terms of current prices, by the farmers from the crop were higher than the MSP announced by the Government of India for all the years (Figure 12.2). The prices touched an Rs 8,000 per quintal mark in 2013–14 and 2018–19. The prices fell after 2013–14 from Rs 8,224 per quintal to Rs 5,500 per quintal in 2016–17. The three-year average shows an increase in the prices across periods, with a slight decline in the 2014–17 period. In real terms, the prices realised fluctuated between Rs 1,900 per quintal and Rs 2,800 per quintal with periodic increase and decrease across the seven years.

The prices for Gujarat and Rajasthan remained above the MSP across all the years. The average prices realised for Gujarat were about Rs 5,500 per quintal and the average for Rajasthan was about Rs 5,200 per quintal across the years. On the other hand, the prices realised for the state of Odisha fell below the MSP for five years in this 20-year period. The gap between the prices realised and the MSP has also increased in recent years for the state. The average prices realised were also below the all-India average at around Rs 3,600 per quintal across the years.

Figure 12.2 *Prices realised by farmers (implicit rate) and MSP for sesamum, all India, 2000–01 to 2019–20* in Rs per quintal (current prices)



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20 (for implicit rates) and CACP (for MSP).

12.3 Yield and Input Use

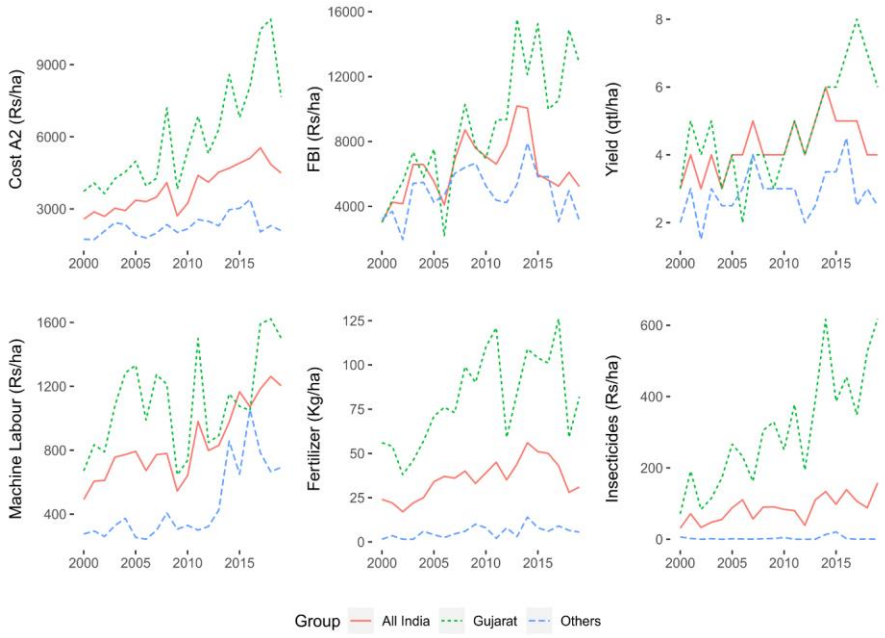
The yield, at an all-India level, ranged between 3 quintals per hectare and 6 quintals per hectare across years. The three-year average yield remained at 4 quintals per hectare in 2000-02 and 2017-20, ranging between 3 and 5 quintals per hectare across the periods. Data from the crop production statistics show that yields remained between 3 and 4 quintals per hectare across the years, indicating a general trend of stagnation. The all-India average seed use also remained between 4 kg per hectare and 6 kg per hectare across the years. The fertilizer use has increased from 23 kg per hectare in 2000–02 to 52 kg per hectare in 2014–17, after which it has dropped to 34 kg per hectare in 2014–17. Human labour use has remained around 350 hours per hectare to 400 hours per hectare across the three-year periods. Animal labour use has witnessed a decrease from 30 hours per hectare in 2000–02 to 8 hours per hectare in 2017–20 with some increase in 2005–08.

The state-specific yield was highest for Gujarat at 5 quintals per hectare and it was lowest for Rajasthan at just 2.6 quintals per hectare. For Gujarat, the yield peaked at 8 quintals per hectare in 2017-18. And, the three-year average shows an increase in yields for Gujarat from 4 quintals per hectare in 2000–02 to 7 quintals per hectare in 2017–20, while the average yield dropped to 3 quintals per hectare in 2005–08. The average seed use was highest for Odisha at 10 kg per hectare

across the years and it was just 4 kg per hectare for both Gujarat and Rajasthan. The fertilizer use was highest for Gujarat with an average use of 81 kg per hectare across the years. The fertilizer use for Gujarat has fluctuated across the three-year periods with 2014–17 having the highest average fertilizer use at 105 kg per hectare. Odisha had the lowest average fertilizer use at just 3 kg per hectare. Human labour use was also highest for Gujarat at 443 hours per hectare followed by Odisha at 414 hours per hectare.

Group-wise analysis of yields and input use show an interesting pattern (Figure 12.3). Higher yields are correlated with increased incomes — especially for Gujarat. Gujarat also had higher use of fertilizers, insecticides, and machine use per hectare. The states that lagged — Odisha and Rajasthan — had low input use in all these three categories. It is noteworthy here that the higher the inputs, the higher the returns, especially for Gujarat.

Figure 12.3 *Costs, incomes, yields, and input use for sesamum, all-India and groups of states, 2000–01 to 2019–20*



Source: Calculations from the state-level reports from the CCPC Scheme, 2000–01 to 2019–20.
Note: Others refer to Odisha and Rajasthan.

13 Conclusion

In this Report, we analysed the trend in costs, incomes, prices, input use, and other data reported by the cost of cultivation surveys (the CCPC Scheme) at the national level and that of selected states for 10 crops.

We use the costs and income concepts employed by the CCPC Scheme and the estimates provided in the state-level reports released by the Scheme. The costs concepts that we use in this Report are Cost A2, which includes all paid-out costs; Cost A2 + FL, which is Cost A2 *plus* the imputed value of Family Labour (FL); and Cost C2, which is Cost A2+FL *plus* the imputed costs for the owned land used for cultivation and other fixed assets. The corresponding income measures are farm business income (FBI), net income 1 (NI1), and net income 2 (NI2), which are obtained by subtracting the respective costs from the gross value of output (GVO). The GVO is the sum of the main product and the by-product from cultivation. In addition to these measures, we also examined profitability, defined as the ratio of GVO to the costs of cultivation. To account for changes in overall price levels, we compared the costs and income measures by deflating them using state-specific consumer price indices for agricultural labour (CPI-AL).

Our examination of trends for the last two decades brought out several interesting findings. A summary of the analysis, for the selected 10 crops, is as follows:

1. The profitability measures (at all levels of costs) for paddy increased in the 2000s and declined after peaking in 2008–11. The all-India average real net income at Cost C2 (NI2) was Rs -253 per hectare in 2014–17, implying losses if returns are evaluated at economic costs. Among different components, machine labour costs increased from 10 to 20 per cent of Cost A2 during the period of analysis. The yield increased from 32 quintals per hectare in 2000–01 to 43 quintals per hectare in 2019–20. At the all-India level, the prices realised by farmers (implicit rate) have been less than the MSP for most of the years, with the gap between the prices realised and the MSP increasing in recent years. Among the states under consideration, Punjab, Andhra Pradesh, and Tamil Nadu have real incomes higher than the all-India average with high fertilizer and insecticide use. While the states with lower incomes, Odisha, Uttar Pradesh, and West Bengal also are seeing increasing costs, their yields have remained substantially lower, resulting in maintaining the inter-state disparities.

2. The profitability at Cost A2 of maize declined in the last decade after reaching a high of 223 per cent in 2008–11. In 2017–20, the profitability at Cost A2 came down to 185 per cent. Although the all-India average real FBI increased from Rs 3,507 per hectare in 2000–02 to Rs 8,563 per hectare in 2017–20, the real FBI has remained around this level in the last decade. The real costs increased in the last decade. The prices realised by farmers were lower than the MSP for all years and across most of the states. There was a sudden spurt in real incomes during the late 2000s and the early 2010s for Bihar, making it stand apart from other states. Although the yield levels were higher in the later periods for Bihar, the real incomes had fallen from the peak levels.

3. The profitability at Cost A2 for *urad* declined to an all-time low of 147 per cent in 2017–20. The real FBI was Rs 2,641 per hectare in 2017–20, only about one-third of the average in 2014–17. The average Cost A2 fluctuated across the periods, although with an overall increase from 2000–02 to 2017–20. Machine labour cost as a share of Cost A2 increased substantially, by almost 22 per cent from 2000–02 to 2017–20. The average yield across the years remained stagnant at 6 quintals per hectare. In terms of input use, fertilizer use varied widely across states. Maharashtra was the largest user of fertilizer with an average of 53 kg per hectare. Andhra Pradesh had higher costs, incomes, and yields for almost all the years as compared to other states like Odisha, Tamil Nadu, Uttar Pradesh, and Maharashtra.

4. The profitability at Cost A2 for gram declined in the 2010s by almost 80 percentage points from the 2000s. The real FBI kept fluctuating across the years, whereas the real costs kept on increasing. The Costs A2, A2+FL, and C2 were the highest in 2017–20 when the real incomes realised were lower than the previous three-year period. While the all-India average prices realised by farmers were higher than the MSP for most years, this situation has reversed in the last three years. Rajasthan had higher costs per hectare than the all-India average, partly on account of lower fertilizer and seed costs. It also had higher incomes on account of the increased yields, particularly in the last five years.

5. The profitability measures for *arhar* declined sharply after 2015–16. The all-India average real FBI fell in 2017–20, by more than one-third of the level in 2014–17. Human labour cost share remained a major share in Cost A2 and Cost A2+FL. The yield increased from 8 quintals per hectare in 2000–02 to 11 quintals per hectare in 2017–20. Apart from a brief

period in the mid-2010s, the all-India average prices realised by farmers were lower than the MSP. The gap in yields is a major contributor to different incomes across states. Maharashtra and Uttar Pradesh had a higher average real FBI than Andhra Pradesh, Karnataka, and Madhya Pradesh, partly on account of differences in input use and resultant yields.

6. For mustard, the profitability at Cost A2 increased from 201 per cent in 2000–02 to 401 per cent in 2008–11 and then declined to 283 per cent in 2017–20. The all-India real FBI reached the highest level of Rs 14,407 per hectare in 2011–14. The prices received by the farmers against the MSP were higher during 2002–05, 2005–08, and 2008–11, after which the average price realised by the farmers fell below the MSP, and the gap between the two increased substantially. Among different states, Haryana, Rajasthan, and Madhya Pradesh had average incomes higher than the all-India average. West Bengal and Uttar Pradesh, which incurred higher human labour and fertilizer costs, had lower average incomes than the all-India average.

7. The average profitability at Cost A2 for groundnut was 177 per cent across the years. The profitability witnessed a decline from 2013–14, even when the real costs of cultivation also declined. The all-India average real GVO fell almost by Rs 5,000 per hectare resulting in a fall in incomes and profitability during this period. The seed cost and human labour cost constituted a major share in the Cost A2 and Cost A2+FL for groundnut, with the share of seed cost increasing over the years. The prices realised fell below MSP after 2016–17. Gujarat and Tamil Nadu had higher yields and incomes than the other states — Andhra Pradesh, Karnataka, and Maharashtra. While trends across these two groups of states were moving closer in the 2010s, the gap in yields widened later resulting in different incomes afterwards.

8. The profitability at Cost A2 from soybean cultivation, after increasing in the 2000s, has declined sharply in recent years. The real FBI has also witnessed negative growth rates from 2011–14 to 2014–17 and from 2014–17 to 2017–20. Human labour, seed, and machine labour constituted the major share of all paid-out costs. According to CCPC data, the average yield from the crop remained between 11 and 13 quintals per hectare. While Maharashtra had higher costs and yields than the all-India average, the real incomes remained lower than the all-India average. Other states — Rajasthan and Madhya Pradesh

— had lower Cost A2 but higher FBI than the all-India average, probably owing to the higher prices realised by these states for their produce.

9. The profitability at different levels of costs remained low for sunflower. In fact, the profitability at Cost C2 indicated losses for most years. The average all-India real FBI across the years was Rs 2,970 per hectare across the periods. The costs of cultivation increased across the years, largely driven by an increased share of human and machine labour costs. The sunflower yield increased from 6 quintals per hectare in 2000–02 to 8 quintals per hectare in 2017–20. The gap between the prices realised and the MSP has widened in the 2010s. While Karnataka, the only state that has data for 20 years, has higher profitability measures than the all-India average, the incomes were lower than the all-India average. It also had lower yields and input use, particularly human labour use, than the all-India average.

10. The profitability at Cost A2 of sesamum cultivation dropped to its lowest in recent years with a decline in real FBI and real GVO. The cost of cultivation has increased over the years. The share of cost components like human labour cost, machine labour cost, insecticide cost, and seed cost have increased. While the all-India average prices realised by farmers were higher than the MSP, the yield at the all-India level has remained low (compared to other crops) between 3 and 5 quintals per hectare. Gujarat had higher incomes and yields, along with a higher input use (fertilizers, insecticides, and machine use) per hectare than the all-India average. Odisha and Rajasthan, the other two prominent states, had low input use in comparison.

Ranking of crops according to incomes provides us with some valuable information. Figures A-11 to A-13 in the Appendix show a ranking based on boxplots of real incomes. The top three crops in terms of all-India average real FBI were mustard, paddy, and *arhar*. The variation across crops in terms of real NI1 shows that the top three crops were mustard, paddy, and gram. In terms of real NI2, the top three are mustard, gram, and *arhar*. At the bottom end is the sunflower for all the measures of income. There were many instances of negative all-India average NI2, with the yearly averages for maize and sunflower below zero for most of the years. These insights are useful for strategies of crop diversification, especially in selecting crops that would preserve the income levels of farmers.

Taking all the individual trends into consideration, we highlight three key broad insights from our study, which are relevant to the general discussions on agricultural policy.

First, the levels and changes in yields show that (a) there are substantial yield gaps to be bridged, especially if average yields in India are compared to yields across the world; (b) there are intercrop disparities in changes over time with some crops achieving higher growth rates in yields than others; and (c) there are inter-state disparities with some states performing much better than others. The all-India average yield in paddy for 2019-20 was about 40 per cent lower than the average yield in China. Over the last two decades, the average yields increased for paddy, maize, *arhar*, mustard, and groundnut. However, yields stagnated for *urad*, sesamum, and soybean. Even among crops that have seen a high increase in yields, selected states have higher yields with other states struggling to catch up with the leading states. For example, the yield of paddy in Punjab averaged 65 quintals per hectare whereas the yield was lowest for Odisha, averaging 33 quintals per hectare, around half of the levels in Punjab.

There are various reasons for yield improvements across time. In the case of groundnut, the seed use has increased over time, which could explain the improvements in yields. For paddy, the average seed use at the all-India level has fallen while yields increased, probably indicating a shift in technology. Inter-state disparities in yields along with the differences in input use point to some possible sources for improving yields. A detailed analysis of these factors is important as improvements in yields would also potentially lead to increased farm incomes.

Secondly, there has been a rise in costs of cultivation across the board, although the extent of increase varies across states. Policy measures contribute to the costs of various inputs, including seeds, fertilizers, and irrigation, and these policy decisions differ across states. Our analysis shows a trend decline in the unit costs of fertilizer until 2010–11, which was reversed in the next few years. The real seed cost, specifically for oil seeds and pulses, has risen substantially, which is due to both an increase in the price of seed and the increased seed use per hectare. Higher seed prices can be a result of an influx of more private players in the market and a decrease in the market share of cooperatives. However, the available database is not adequate to identify specific reasons for cost escalation.

It is evident that farmers have some budget constraints, and farmers must balance the allocation of inputs (and costs) within this constraint. Both operational costs and fixed costs have increased

in real terms over the 20-year period. However, the structure of costs has changed with components such as the animal labour costs and manure costs declining in relative importance for almost all crops. A rise in one kind of cost component, machine labour in many crops, could lead to a reduction in expenditure on other cost components. While we have seen some indications in this direction, such as the stagnation in the share of irrigation costs for some crops, the issue needs further investigation.

Finally, the profitability measures show a decline in recent years for all crops. While increased costs may have contributed to a decline in profitability, equally important perhaps is the problem of non-remunerative prices. Prices realised by farmers have been lower than the MSP for many crops, with the gap between the MSP and realised prices widening in the last three years. Although several low-performing states (in terms of yields) have seen increased costs, these have not been associated with higher returns and the profitability continue to decline in these states. The reduction in profitability is likely to constrain the capacity of farmers to make further investments in new technology.

Higher costs per se are not bad for farmers if associated with higher returns from farming. The state-wise analysis shows that mechanisation and improvements in technology have happened in the last two decades across different crops and states. Nevertheless, profitability remains low suggesting that there is scope for better prices, reduced costs, and improved yields. Reversing the recent negative trend in profitability and incomes requires a suite of policy and institutional measures specific to local contexts.

We would like to end the Report by reiterating the cautionary notes from the introduction and methodology sections. This study was conducted using state-level data from the CCPC Scheme which had its own limitations. While it permits for a detailed analysis at the level of regions in India, the data source does not allow for the analysis of different size-class of farmers. Even within the state-level reports, we have used only the reported information and have not attempted a validation with the unit-level data. The CCPC Scheme collects rich data at the level of farm households, and a detailed analysis of various aspects of farm management can only be carried out with access to the unit-level data. Such a detailed analysis of various factors influencing crop incomes would provide valuable insights into the patterns we see at the national and state levels.

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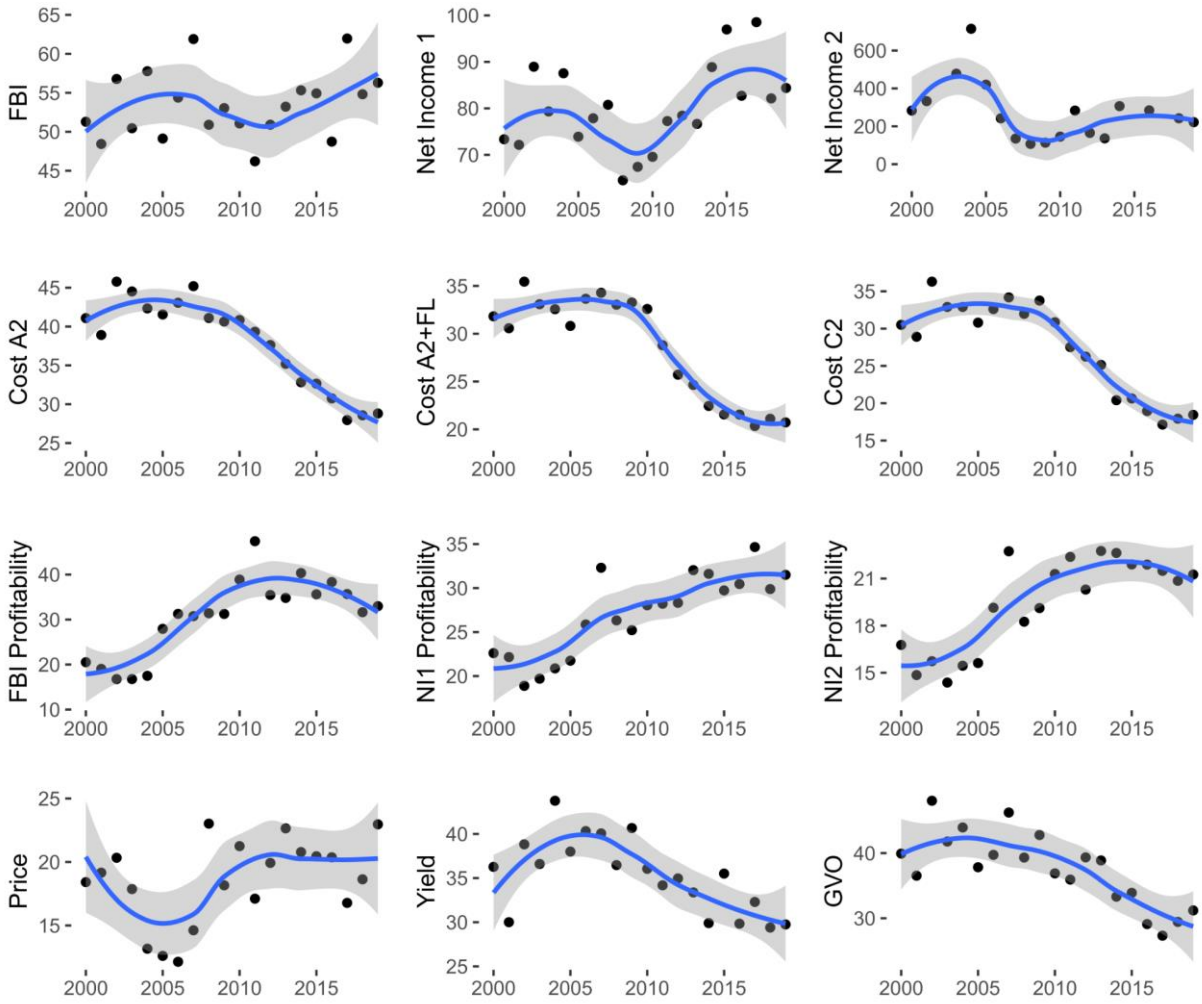
Figure A-1 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for paddy, 2000–01 to 2019–20* in per cent



Note: The fitted line is obtained by the loess() function in R, which takes a weighted average of the nearest points. The shaded area represents a 95% confidence interval. (This note is also applicable for Figures A-2 to A-10 in the Appendix).

Figure A-2 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for maize 2000–01 to 2019–20* in per cent

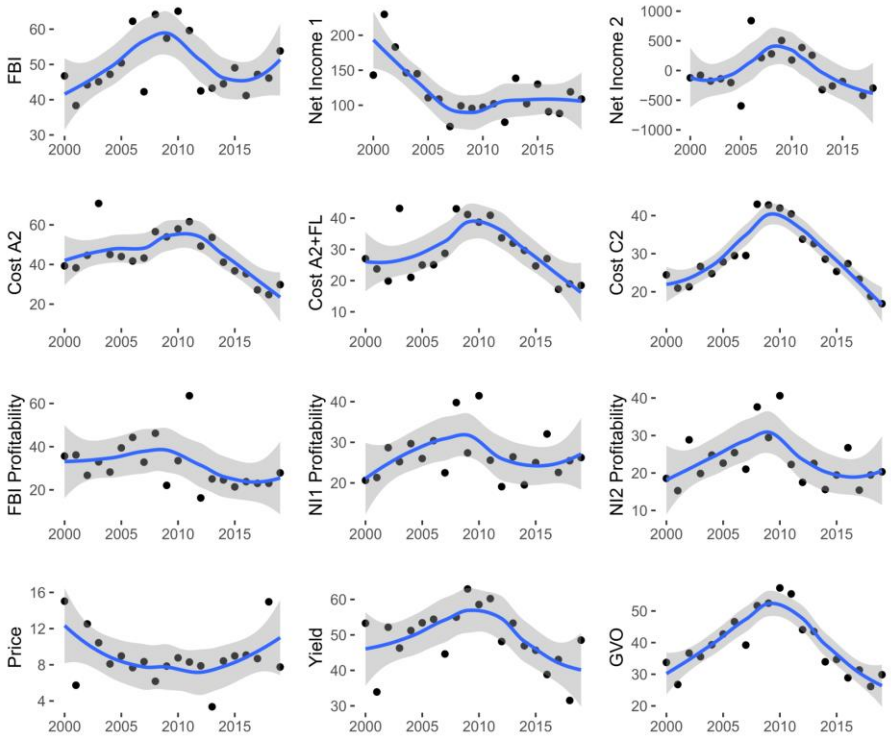


Figure A-3 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for* urad *2000–01 to 2019–20* in per cent

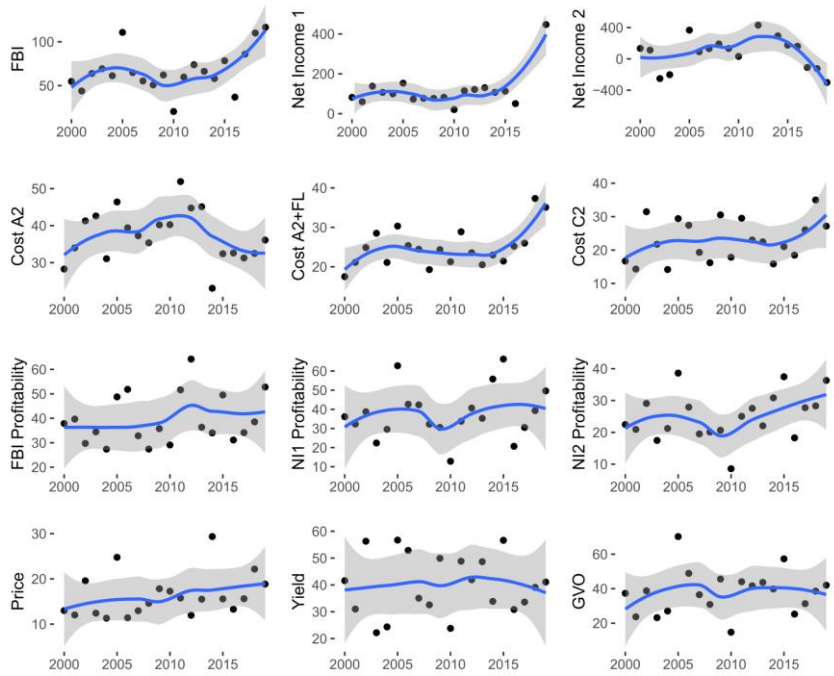


Figure A-4 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for gram 2000–01 to 2019–20* in per cent

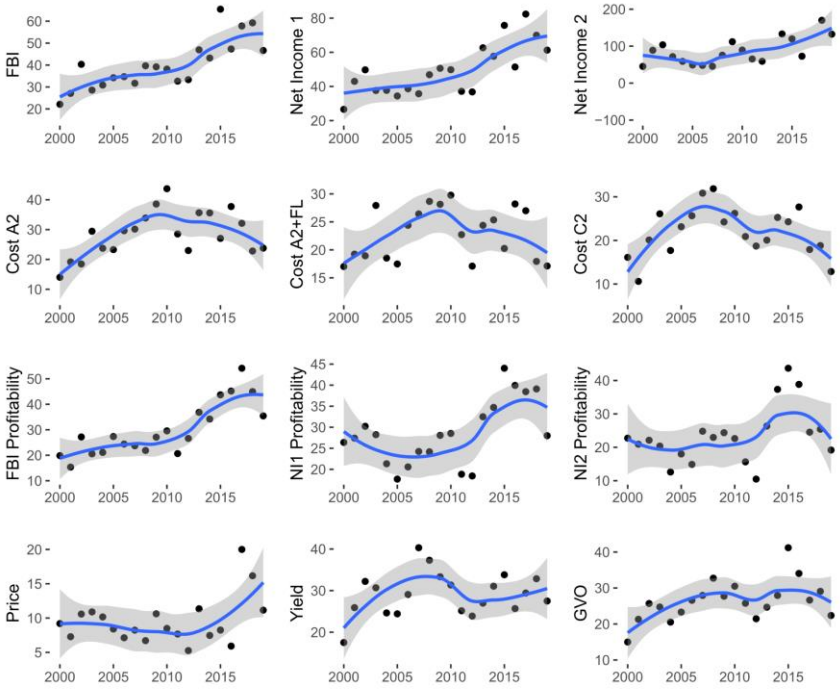


Figure A-5 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for* arhar *2000–01 to 2019–20* in per cent

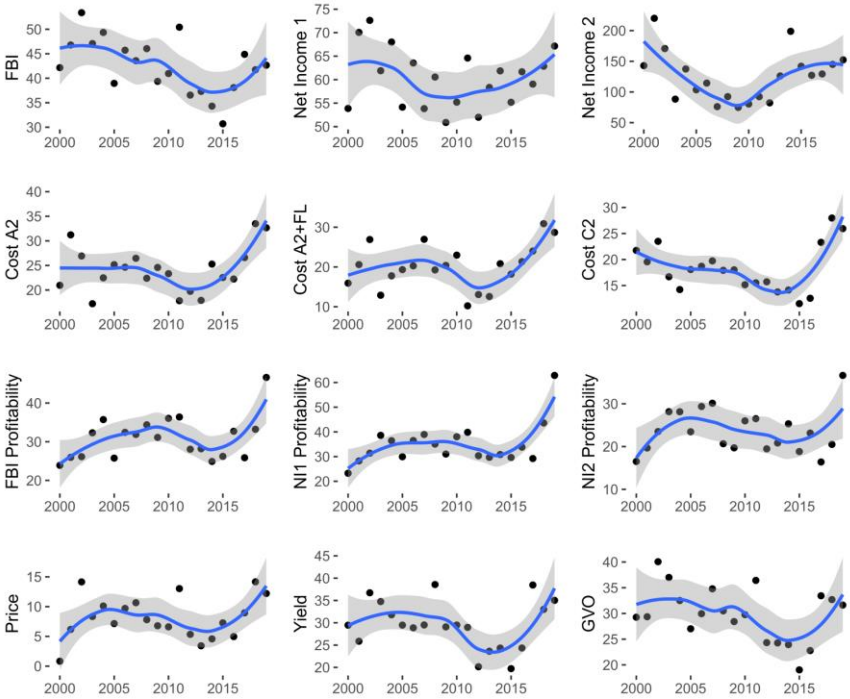


Figure A-6 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for mustard 2000–01 to 2019–20* in per cent

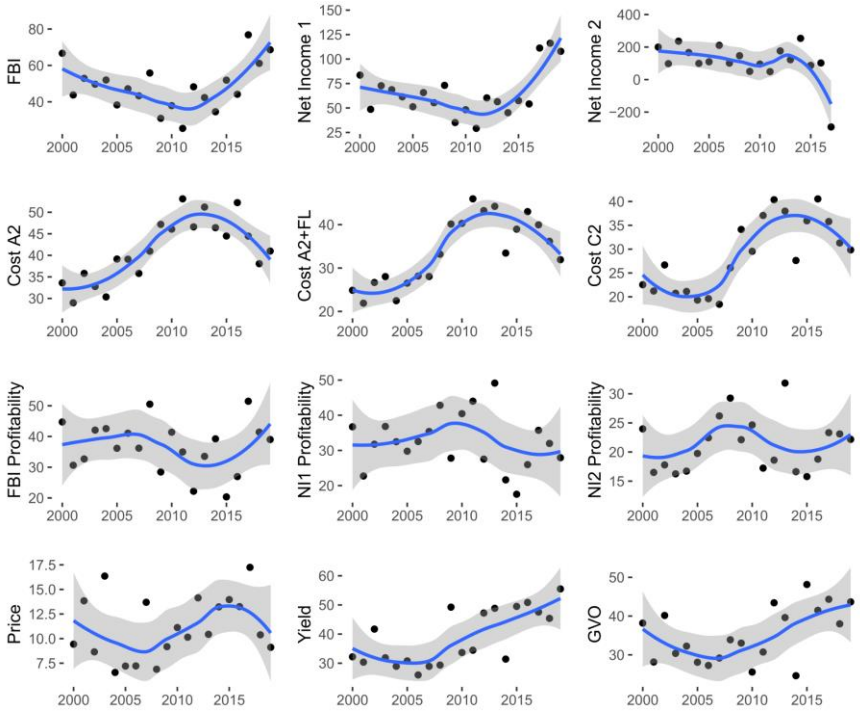


Figure A-7 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for groundnut 2000–01 to 2019–20* in per cent

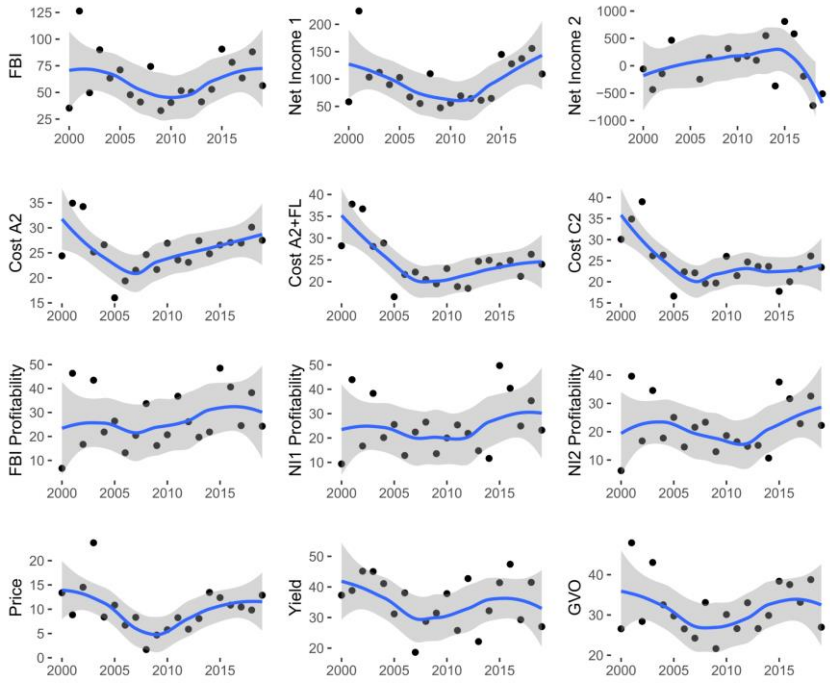


Figure A-8 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for soybean 2000–01 to 2019–20* in per cent

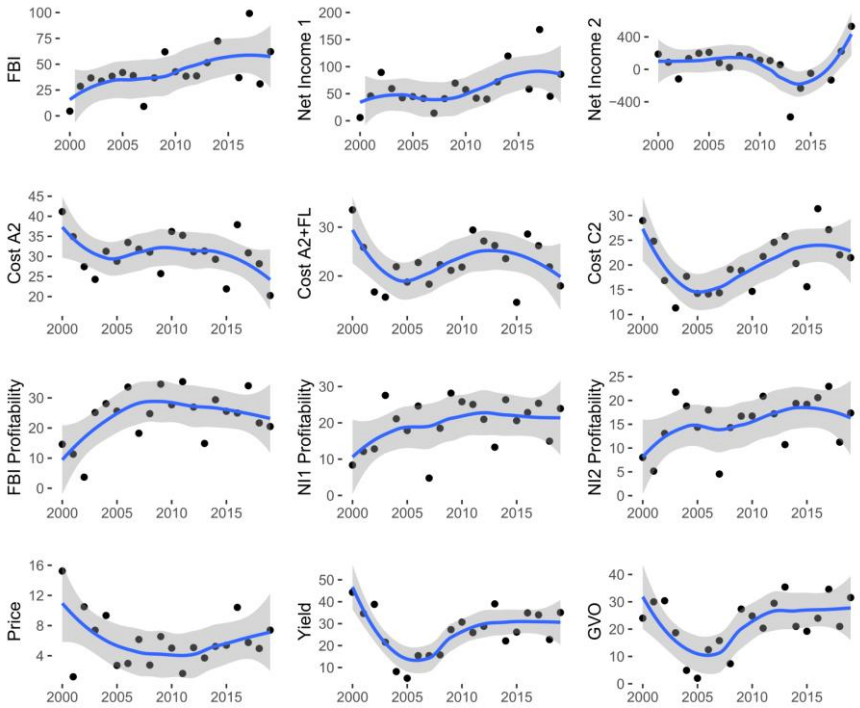


Figure A-9 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for sunflower 2000–01 to 2019–20* in per cent

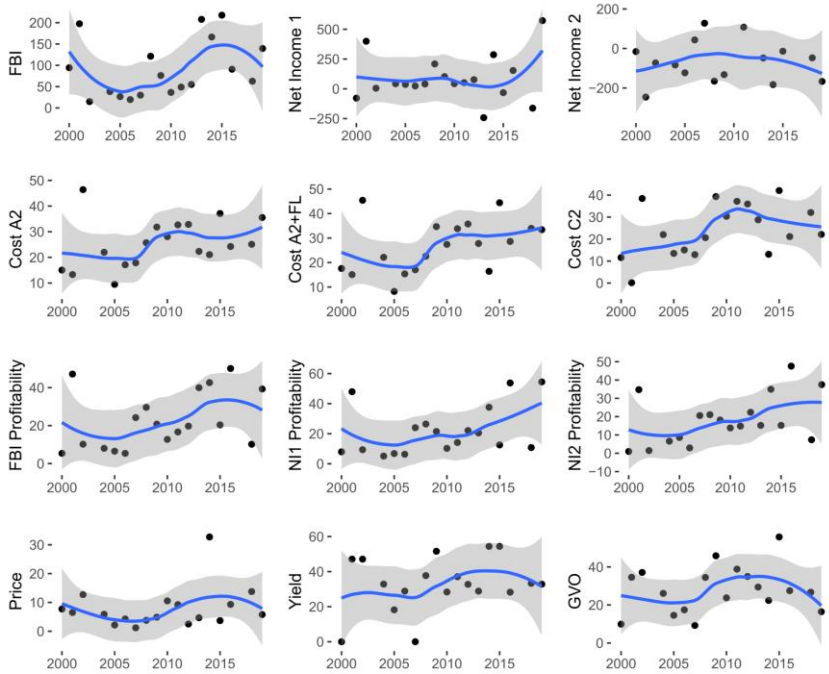


Figure A-10 *Coefficient of variation (CV) for different measures of incomes, costs, and profitability, and price, yield, and gross value of output (GVO) across states for sesamum 2000–01 to 2019–20* in per cent

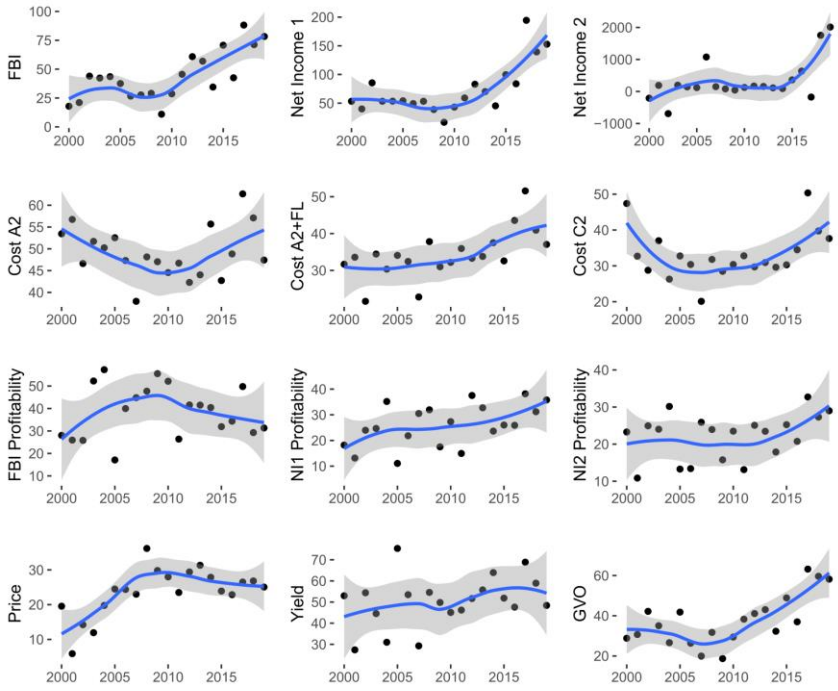
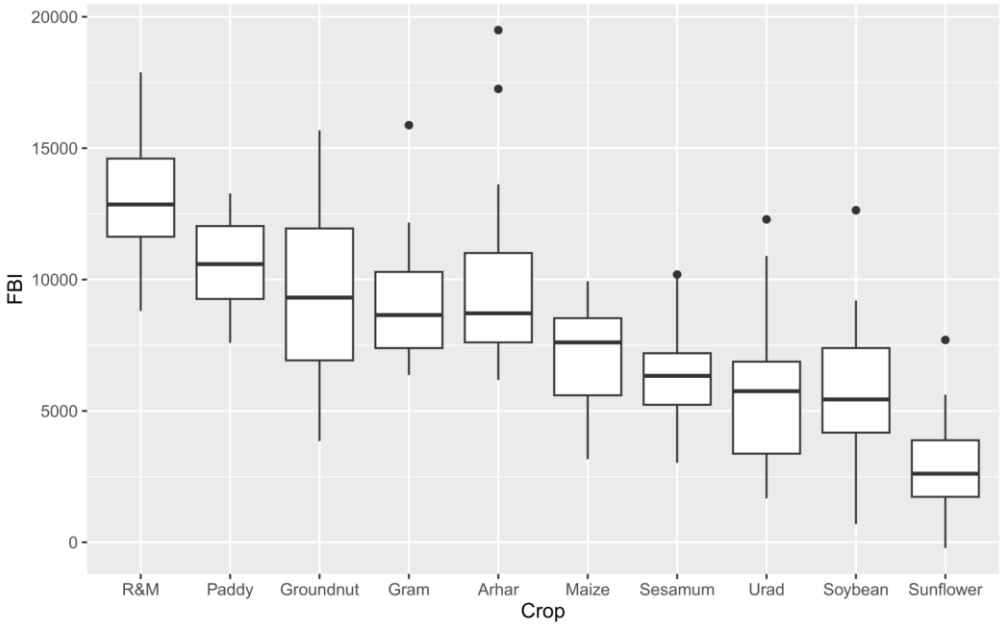


Figure A-11 *Comparison of real farm business incomes (FBI) across crops, all-India weighted average, 2000–01 to 2019–20* in Rs per hectare



Note: Real income measures across years is used for plotting the box plot for a crop. (This note is also applicable to Figures A-12 and A-13 in the Appendix).

Figure A-12 *Comparison of real Net Income 1 (NI1) across crops, all-India weighted average, 2000–01 to 2019–20* in Rs per hectare

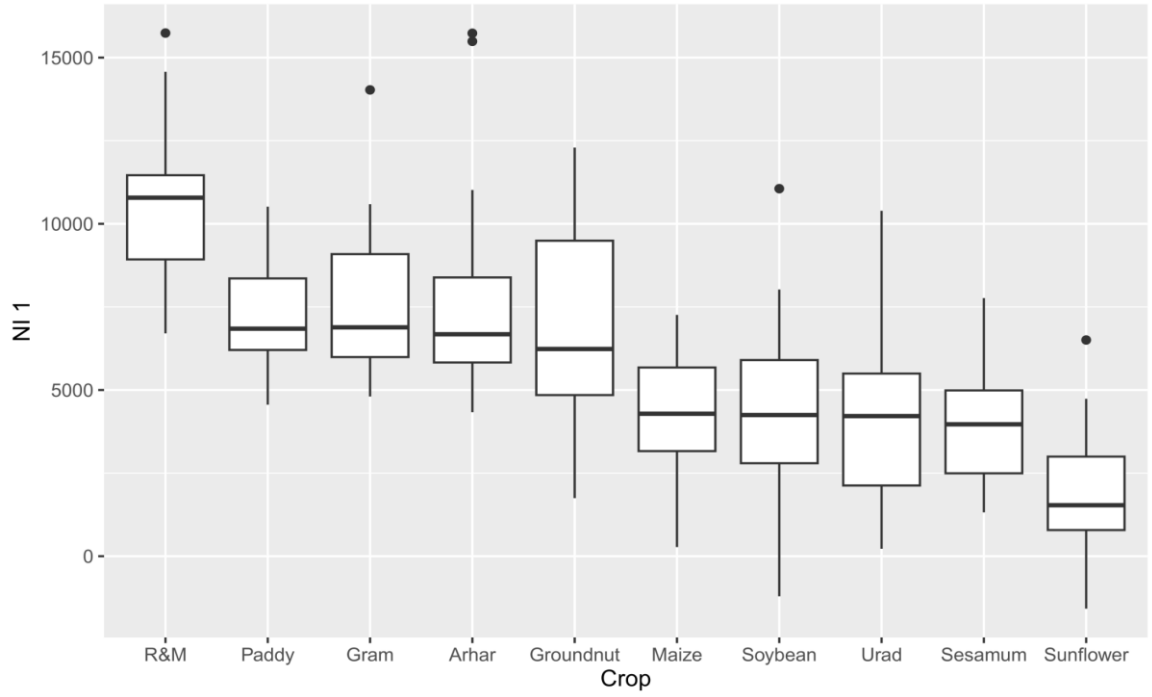


Figure A-13 *Comparison of real Net Income 2 (NI2) across crops, all-India weighted average, 2000–01 to 2019–20* in Rs per hectare