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Trends and Determinants of Farmer Households' Income in India: A Comprehensive Analysis of SAS Data

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ABSTRACT

The issue of farm income has occupied the centrestage of discussion in India's agricultural sector after the publication of the first report on Situation Assessment Survey (SAS) of farmer households for the year 2002-03, which revealed the pathetic income level of farm households. This discussion has continued after the publication of the second SAS report for 2012-13 and now, the third report of SAS has been published (in September 2021) for the year 2018-19. No detailed study has been carried out to find out whether the farmer households' income has increased utilising all the three-time points of SAS data covering different states. An attempt has been made in this study to analyse the trends and determinants of farmer households' income by employing growth and regression analysis. While revealing the pathetic income level of farm households over time, the study shows a deceleration in the growth rate of total annual income between 2012-13 and 2018-19 as compared to the period between 2002-03 and 2012-13. The net income realised from crop production registered a negative growth between 2012-13 and 2018-19, which grew at a rate of 3.81 per cent per annum during the previous period. Close to 70 per cent of the states have also registered negative growth in crop income between 2012-13 and 2018-19, which is not the case in other sources of income. The regression analysis suggests that the percentage of irrigated area to cropped area, average literacy rate of farmer households, expenditure on yield increasing inputs and the total monthly expenditure on crop production appear to be the important determinants of the income of the agricultural households.

Keywords: Crop income; Farm households; Farm income; Growth rate; Literacy rate

JEL.: Q12, Q13, Q15, Q18

I

INTRODUCTION

Although Indian agriculture has made rapid strides in terms of production and productivity of different crops particularly after the introduction of the green revolution during the mid-sixties, one important question that is asked often is whether the huge increase in production has made any impact on the income of farmer households. This question was asked loudly and repeatedly particularly after the early 2000s when a large number of farmers started committing suicides in different parts of the country (Sainath, 2010). But, the researchers could not answer this question adequately and convincingly because of the absence of data on farm income from any source published by the Government of India including the Central Statistical Organisation (Chand,

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2017). Most researchers have relied on the cost of cultivation survey (CCS) data published by the Commission for Agricultural Costs and Prices (CACP) to study the trends in farm income. Sen and Bhatia (2004) using CCS data from 1981-82 to 1999-2000 concluded that the farm business income per farmer was miniscule and inadequate to pay even for the essentials. A large number of researchers have also come out with similar findings after analysing CCS data (Narayanamoorthy, 2006; 2013; 2017; Government of India, 2006; 2007; Dev and Rao, 2010; Narayanamoorthy and Suresh, 2013; Narayanamoorthy *et al*., 2014). But, the data from CCS was crop-specific and therefore, the farm households' income was not adequately reflected from its analysis.

Understanding the value of farm income related-data, with the initiative of the Union Ministry of Agriculture, NSSO has released the data on farm income and other related parameters for the first time in 2002-03 through its reports popularly known as Situation Assessment Survey (SAS) of farm households (NSSO-SAS, 2005). Following the publication of the report, the second SAS data series was published by NSSO for 2012-13 (NSSO-SAS, 2014) and now the third survey of SAS for the year 2018-19 has been released in September 2021 (NSSO-SAS, 2021).

Immediately after the publication of SAS data for the year 2002-03 that was published in 2005, a large number of studies were carried out focusing on farm income and other related issues. Utilising SAS data pertaining to the year 2002-03, Narayanamoorthy (2006) has analysed the farm income level of different states and also compared it with the annual consumption expenditure of the farmer households. While showing the pathetic income levels of different states, the study finds that the cultivation income accounts for only 45 per cent of the total income at the all-India level. Shockingly, the study also finds that the annual consumption expenditure exceeding the total annual income of the farm households in 13 out of 16 states considered for the analysis. Similarly, the pathetic condition of income levels of the farm households has also been clearly highlighted using SAS data of 2002-03 by the Expert Group on Agricultural Indebtedness under the Chairmanship of Prof. R. Radhakrishna (Government of India, 2007).

With the use of NSSO-SAS data of 2002-03 and 2012-13, Chandrasekhar and Mehrotra (2016) studied the farm income in the context of doubling of income by 2022-23 as envisaged by the Union Government. The study finds that the increase in net income from cultivation is very less (1.32 times) as compared to the net income realised from the farming of animals (3.21 times) between the two periods. It also finds no evidence of doubling farm income from the source of cultivation at all India level. Satyasai (2016) made an attempt to study the issue of doubling farmers' income by 2022 based on 59th (NSSO-SAS, 2005) and 70th (NSSO-SAS, 2014) round NSSO Situation Assessment Surveys. The study shows that doubling the farm income over 5 to 6 years in nominal terms is already happening, while doubling the real income of farmers in six years is a formidable task. While studying the income level of farmer households with the use of SAS data of 2002-03 and 2012-13, Narayanamoorthy

(2017) found a wide variation in income levels across the states. Importantly, the study also shows that there were no significant differences in farm income between the group of highly irrigated states and the group of less-irrigated states.

Taking the data from the "Committee on Doubling of Farmers' Income" which has used NSSO-SAS data of 2002-03 and 2012-13 to project the time needed to double the farm income, Gulati *et al.,* (2019) concludes that "While we don't have data on farmers' incomes after 2015-16, given growing farmer distress, it is unlikely to have increased more rapidly than at the earlier pace of 3.6 per cent. While the goal of doubling farmers' incomes by 2022-23 is very unlikely (at least if the source of income is solely agriculture), a combination of increases in farming income, non-agriculture farm income, off-farm income, and income transfers, can achieve this goal in the near future" (p.2).

Bathla and Kumar (2019) studied the income differences of agricultural households in 20 major states of India with the help of SAS data 2002-03 and 2012-13. They found significant differences in the sources of income generation of agricultural households across the states. Among the factors examined to explain income inequalities, non-farm business income, land and farm assets contributed the maximum to the tune of 28.6 per cent, 25.8 per cent and 14.3 per cent respectively across India with considerable differences in their share in each state.

Birthal *et al*., (2014) analysed the farm households' access to different income-generating activities and their impact on income distribution using SAS data of 2002-03. They show that the farm households earn close to half of their income from non-farm activities, which is against the common perception of agriculture being the dominant source of income for farm households. They also find that the non-farm income is more important for the households at the lower end of land distribution. In another study, Birthal *et al*., (2015) examined the farmers' preference for farming using SAS data of 2002-03 with rigorous econometric analysis. They conclude that "farmers who express a preference for moving out of agriculture are mostly those with small landholdings, poor irrigation facilities, fewer productive assets including livestock, and follow a cereal-centric cropping pattern. They also have relatively lower access to credit, insurance, and information, and are weakly integrated with social networks such as self-help groups and farmers' organisations. Importantly, the disinclination for farming, conditional on other covariates, is not significantly differentiated by caste, an important indicator of social status in rural India. Yet, within a caste group, the dislike for farming moderates with larger landholdings".

Similar to the study of Birthal *et al*., (2015), with the help of unit-level SAS data of 2002-03, Agarwal and Agarwal (2017) made a rigorous analysis to find out the answer to the question: What distinguishes farmers who like farming from those who do not? They find that "those who dislike farming operate and own somewhat smaller farms. Their average operated and owned areas are 0.85 and 0.78 ha, respectively, compared with 1.36 and 1.26 ha for those who like farming. Also, among the dissatisfied farmers, a smaller percentage have access to irrigation and credit

(especially government credit), are aware of government measures such as minimum support prices (MSPs), have crop insurance, know about bio-fertilisers, or are members of SHGs or farmers' organisations. In fact, across all farmers, membership in farmers' organisations is very low (2.4 per cent), and barely 4 per cent have ever had crop insurance. The dissatisfied farmers, however, have more working-age members per unit area, suggesting a surplus labour situation; and a smaller proportion of them have pucca housing".

In addition to the above reviewed studies, many studies have also been carried out focusing on the farm income and its related aspects utilising SAS data of 2002-03 and 2012-13 (Deshpande and Prabhu, 2005; Sendhil, *et al*., 2017; Das, 2017). Now, in addition to these two-time points data, the National Statistical Office has released the SAS data for the year 2018-19 during September 2021, which contains rich data on income and other parameters of agricultural households for as many as 28 states. To the best of our knowledge, no detailed study is available on the trends in the income of farmer households covering all the three-time points of SAS data. Particularly, studies are seldom available on analysing the determinants of total income and also the net income from crop production of farmer households using SAS data of 2018-19. After the publication of SAS data for the year 2012-13, many changes in the production of agricultural commodities and in MSP policies have taken place, which may have considerably impacted the incomes of farmer households. In this study, therefore, an attempt has been made to analyse the trends and determinants of the income of farmer households using state-wise SAS data of all the three-time points, with the following specific objectives: (1) To analyse the state-wise absolute trends in the income of farmer households by source covering three-time points of SAS data. (2) To study state-wise growth pattern of income of farmer households by source covering three-time points of SAS data. (3) To analyse the determinants of the net monthly income of farm households realised from the source of crop production covering the data of 28 states. (4) To analyse the determinants of the total monthly income of farm households covering the data of 28 states.

II

DATA AND METHOD

The data for the study has mainly been compiled from the report of the *Situation Assessment of Agricultural Households and Land and Holdings of Households in Rural India 2019* released by the National Statistical Office in September 2021(NSSO-SAS, 2021). However, for the purpose of studying the trends in farmer households' income, farm income-related data has also been compiled from the two earlier reports of the Situation Assessment Survey of farm households published by the NSSO for the year 2002-03 (NSSO-SAS, 2005) and 2012-13 (NSSO-SAS, 2014).

Although the farmer households' income (FHI) related data has been published for as many as 28 states for the year 2012-13 and 2018-19, the same data was published

only for 18 states for the year 2002-03. Therefore, the trend analysis on FHI has been carried out by covering the data of 18 states. These 18 states accounted for about 93.90 per cent of India's total estimated rural households and about 94.90 per cent of cropped area in 2018-19. One of the major objectives of the study is to analyse the growth trends in FHI across the states. For this purpose, an annual compound growth rate (ACGR) has been computed for FHI. To have a meaningful comparison of FHI across three different time points, all the income and expenditures related-data involving money value has been converted into constant prices using the deflator of Consumer Price Index of Agricultural Labourers (CPIAL) with the base year of 2004-05.

A major focus of the study is to analyse the determinants of farmer households' income. Among different sources of income earned by the farmer households, income realised from the crop production activities is a key element, which is also an issue under discussion today in India (see, Narayanamoorthy, 2021). Besides the total monthly income, SAS reports provide data on source-wise monthly income for farmer households under five different heads namely, (1) income from wages, (2) income from leasing out of the land, (3) net receipt from crop production, (4) net receipt from farming of animals and (5) net receipt from the non-farm business. Our objective is to study the determinants of both the total monthly income of farmer households (TMIA) as well as the monthly net income from crop production of farmer households (MICP). Therefore, the following two separate regressions (OLS method) have been estimated:

$$TMIA = \beta_0 + \beta_1 AHTA + \beta_2 AICP + \beta_3 HPLO + \beta_4 LTAH + \beta_5 MECP + \beta_6 PIRA \quad \ldots. (1)$$

$$MICP = \beta_0 + \beta_1 AHTA + \beta_2 AICP + \beta_3 ESFP + \beta_4 HPLO + \beta_5 LTAH + \beta_6 MECP + \beta_7 PIRA \quad \ldots. (2)$$

where,

TMIA = Total monthly income per agricultural household (Rs.)
MICP = Monthly income (net receipt) from crop production (Rs.)
β_0,……., β_1 = Parameters to be estimated
AHTA = Percentage of agricultural households accessed technical advice
AICP = Share of agricultural households involved in crop production (per cent)
ESFP = Share of expenditure on seeds, fertiliser and plant protection in the total monthly expenditure on crop production (per cent)
HPLO = Share of agricultural households possessing land less than 1.00 ha (per cent)
LTAH = Literacy rate of agricultural households among persons age 7 years and above (per cent)
MECP = Monthly expenditure on crop production (Rs.)
PIRA = Share of irrigated area to cropped area (per cent)

It is a known fact that the income of agricultural households is determined by both economic and social factors. Therefore, a total of seven independent variables having

economic and social characteristics have been used for estimating the above-specified regressions models. All the independent variables included in the regression models are one way or the other expected to influence the income of farm households. Land holding is an important factor in determining the income of the farm households and therefore, the variable HPLO has been used in the analysis representing the characteristic of land class. An increased number of households involved in crop production can make a dent in the income and therefore, the variable AICP has been used. Along with AHTA, the variable LTAH has been included in the analysis because the literacy rate of farmers in many ways helps them to adopt the modern technology in agriculture, allows them to have outside contacts as well as help increase the bargaining power in the market, which are also proved by studies (Narayanamoorthy, 2000; Panda, 2015; Agarwal and Agarwal, 2017). The adoption of yield-enhancing inputs such as seeds, fertiliser and pesticides, total expenditure on crop production and the irrigation coverage to the cropped area are the important determinants of crop productivity and therefore, the variables such as ESFP, MECP and PIRA have been included in the analysis. Except for the data on irrigation (PIRA) variable [which is compiled from the source of 'Land Use Statistics at a Glance' (Government of India, 2021) published by the Ministry of Agriculture and Farmers Welfare, Government of India], all other variables included in the regression model have been compiled from the SAS report of 2018-19 (NSSO-SAS, 2021).

III

TRENDS IN INCOME OF FARMER HOUSEHOLDS

As mentioned earlier, besides studying the determinants of the income of farmer households using state-wise SAS data of 2018-19, the study also attempts to analyse the trends and growth pattern of farmer households' income covering all three-time points namely 2002-03, 2012-13 and 2018-19 for which data has been published so far. The following section presents the analysis on the trends in the income of farmer households.

Trends in Annual Income of Farmer Households:

As per the SAS data, the average annual farm income (at current prices) per agricultural household from all sources has increased from Rs. 25,380 in 2002-03 to Rs. 77,112 in 2012-13 and further to Rs. 1,22,616 in 2018-19 at the all-India level. When the same income is converted into constant prices, it increased from Rs. 26,971 to Rs. 38,900 and further to Rs. 45,829. But, a wide variation exists across the states in the total annual income (at constant prices) per agricultural household (see, Table 1). During 2002-03, among different states, the lowest annual income (Rs. 18,236) was

TABLE 1. TRENDS IN STATE-WISE ANNUAL INCOME OF AGRICULTURAL HOUSEHOLDS BY SOURCE AT 2004-05 PRICES

	2002-03					2012-13					2018-19				
State	Wages	Cultivation	Farming of animals	Non-farm business	Total	Wages	Cultivation	Farming of animals	Non-farm business	Total	Wages	Cultivation	Farming of animals	Non-farm business	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1. Andhra Pradesh	8200	9475	1186	1977	20837	15025	12240	6508	2421	36194	21748	12262	9177	2969	47004
2. Assam	12408	22852	1798	3252	40310	8657	25492	4837	1544	40529	25031	14630	5023	3032	47879
3. Bihar	6338	10788	3379	2576	23082	8009	10382	1689	1453	21539	11226	12285	7800	2148	33827
4. Chhattisgarh	9041	10342	-38	1288	20633	11187	20261	-115	6.05	31339	19932	19447	2350	1440	43402
5. Gujarat	11796	14844	5802	1785	34227	16242	17755	11683	2300	47981	19802	19367	15595	1655	56651
6. Haryana	16170	19052	-3010	4540	36752	21133	47623	16012	2609	87377	35257	40779	18030	5602	102445
7. Jammu & Kashmir	26270	30937	4871	7906	69985	44409	18542	4849	8977	76777	54588	8881	10208	9867	84849
8. Jharkhand	11783	10865	1097	2640	26385	11133	8784	7222	1441	28579	12482	4943	3709	709	21955
9. Karnataka	13403	16144	1671	2142	33360	16205	29844	3632	3783	53465	20524	30656	7459	1184	60284
10. Kerala	25670	14283	1964	9143	51060	31805	21375	3481	15309	71965	45753	16317	4709	12899	80351
11. Madhya Pradesh	7141	12701	-2895	1288	18236	8063	24311	4431	781	37593	11159	19326	5808	866	37401
12. Maharashtra	10189	16106	1836	3277	31409	13052	23343	3263	5049	44712	19394	21291	6907	3799	51543
13. Orissa	7307	4285	204	1747	13543	10388	8517	7954	3263	30123	11881	7037	1866	2014	22928
14. Punjab	18644	35987	3010	5611	63252	28930	65754	10037	4601	109321	26825	56499	19990	4548	119757
15. Rajasthan	11872	4578	64	2589	19103	15340	18996	5854	4298	44494	24022	16734	10567	4485	56154
16. Tamil Nadu	14091	8404	1403	2525	26423	17567	11605	6659	6423	42254	29140	11845	8970	3207	53481
17. Uttar Pradesh	7129	10661	676	2359	20825	6962	17283	3287	2276	29802	13007	14756	6122	1736	36155
18. West Bengal	11311	9398	982	4820	26512	12870	5926	1362	3935	24093	16689	6938	2086	4194	30328
All India	10444	12357	1160	3010	26971	12537	18651	4619	3099	38900	18223	17034	7095	2875	45829
Standard deviation	5830.81	8335.84	1591.69	2211.81	15584.78	9729.26	14685.07	3911.30	3566.48	23860.14	11919.52	12829.64	5246.91	3169.69	26695.74
Coefficient of variation	45.88	57.33	79.84	64.77	48.71	58.97	68.12	68.44	91.10	50.05	51.27	69.14	64.52	85.99	48.72

Sources: NSSO-SAS (2005; 2014; 2021).

observed in Madhya Pradesh and the highest income was observed in Jammu and Kashmir (Rs. 69,985). This trend has changed in 2012-13 and 2018-19. For instance, during 2012-13, the lowest income was observed in Bihar (Rs. 21,539) and the highest one was observed in Punjab (Rs. 1,09,321). Similarly, during 2018-19, the lowest income was noticed in Jharkhand (Rs. 21,955) and the highest income was noticed in Punjab, which was about Rs. 1,19,757. The value of coefficient of variation also suggests that there is a wide variation in the annual income of farm households across the states.

Besides studying the annual total income of farmer households, an attempt is made to study whether the performance of states has improved between 2002-03 and 2018-19. For this, all the 18 states were classified into two groups in terms of annual farm income per agricultural household as: the Above National Average (ANA) states and Below National Average (BNA) states. The classification of states shows that there are changes in the performance of states across the three-time points. During 2002-03, the income level of 8 states (Assam, Gujarat, Haryana, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Punjab) were above the national average income of Rs. 26,971 and the remaining 10 states (Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal) were coming under the category of BNA states. But the performance of these states has slightly changed in 2012-13, where Rajasthan and Tamil Nadu have moved to the ANA category of states. Similarly, Andhra Pradesh state has moved to ANA category in 2018-19 from its position of BNA category in 2012-13. What clearly emerges from this analysis is that a total of 7 states (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal) continue to have the income level less than the national average in all the three-time points. Since all these states are predominantly agrarian, it is necessary to study as to why these states are not able to improve their total income?

Trends in Annual Income of Farmer Households by Source:

To address the question of where from the farmer households get their annual income, we analyse their data on source-wise income. The SAS reports provide data on income for farmer households under five different sources which include wages, net receipt from crop cultivation, net receipt from farming of animals, leasing out the land and the non-farm business income. After converting the income data at constant prices, the annual wage income per farmer household has increased from about Rs. 12,709 in 2002-03 to Rs 18,223 in 2018-19 at the all-India level. During the same period, the net income from farming of animals has increased from Rs. 1,994 to Rs. 8,132 and the non-farm business income increased from Rs. 3,415 to Rs.3,686. The income from all these sources has consistently increased over time. However, this has not happened in the case of net receipt from crop cultivation, which is a major source of income for farmer households. The net receipt from crop cultivation increased from Rs. 14,539 in

2002-03 to Rs. 21,557 in 2012-13, but it reduced to Rs. 18,555 in 2018-19 at the all-India level, which is a serious issue.

The income received from crop cultivation by different states also shows a very deplorable picture. In absolute terms, out of 18 states considered for the analysis, the annual crop income has increased in most states (except for 4 states) between 2002-03 and 2012-13. This situation has dramatically changed between 2012-13 and 2018-19, where 12 out of 18 states recorded a reduction of income from crop cultivation. The remaining four states which recorded increased crop income are Bihar, Karnataka, Tamil Nadu and West Bengal, all of which could increase its income only marginally over its previous period 2012-13.

Further to study the crop income in an in-depth manner, we have computed its share to the total annual income of farmer households (see, Table 2). What we study specifically here is that whether the share of crop income has increased across the states over time. The analysis shows that at the all India level, the share of crop cultivation income increased from 45.82 per cent in 2002-03 to 47.95 per cent in 2012-13, but it declined to 37.17 per cent in 2018-19. The state-wise data shows a very pathetic picture, where the share of income received from crop cultivation declined in most states (16 out of 18 states) between 2012-13 and 2018-19 as compared to the period between 2002-03 and 2012-13, where its share has declined only in 7 out of 18 states.

While looking at the recent SAS data of all the 28 states for the year 2018-19, the levels of crop income show a very deplorable position in most states. Only in 5 states, the share of crop income accounts for more than 50 percent in the total monthly income of agricultural households. In 16 out of 28 states, the share of crop income accounts for less than 40 per cent in the total monthly income. What is more shocking is that the share of crop income is less than 25 per cent in 9 states. Particularly, the crop income accounts for less than 20 per cent in states like Himachal Pradesh, Jammu and Kashmir, Jharkhand, Nagaland, Tamil Nadu and West Bengal (see, Figure 1). While one must find out the reasons for the low level of crop income in these states, the data clearly suggests that the income realised on account of crop cultivation by the agricultural households in most states is very poor especially in 2018-19.

Growth Pattern of Farmer Households Income

We have so far studied the absolute trends in the income of farmer households across the states. In this section, we analyse the growth pattern of income across 18 states that are considered for the analysis in the earlier section. This analysis is done specifically to find out the extent of increase in income precisely over time. For this, an annual compound growth rate (ACGR) has been computed for two different periods namely (a) period I between 2002-03 and 2012-13 and (b) period II between 2012-13 and 2018-19.

TABLE 2. SOURCE-WISE SHARE OF INCOME TO TOTAL ANNUAL INCOME OF FARMER HOUSEHOLDS BY STATE

	2002-03 (in per cent)					2012-13 (in per cent)					2018-19 (in per cent)				
State	Wages	Cultivation	Farming of animals	Non-farm business	Total Annual income (Rs.)	Wages	Cultivation	Farming of animals	Non-farm business	Total annual income (Rs.)	Wages	Cultivation	Farming of animals	Non-farm business	Total Annual income (Rs.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1. Andhra Pradesh	39.35	45.47	5.69	9.49	20837	41.51	33.82	17.98	6.69	36194	46.27	26.09	19.52	6.32	47004
2. Assam	30.78	56.69	4.46	8.07	40310	21.36	62.90	11.93	3.81	40529	52.28	30.56	10.49	6.33	47879
3. Bihar	27.46	46.74	14.64	11.16	23082	37.18	48.20	7.84	6.75	21539	33.19	36.32	23.06	6.35	33827
4. Chhattisgarh	43.82	50.12	0.19	6.24	20633	35.70	64.65	0.37	0.02	31339	45.92	44.81	5.41	3.32	43402
5. Gujarat	34.46	43.37	16.95	5.22	34227	33.85	37.00	24.35	4.79	47981	34.95	34.19	27.53	2.92	56651
6. Haryana	44.00	51.84	8.19	12.35	36752	24.19	54.50	18.32	2.99	87377	34.42	39.81	17.60	5.47	102445
7. Jammu & Kashmir	37.54	44.21	6.96	11.30	69985	57.84	24.15	6.32	11.69	76777	64.34	10.47	12.03	11.63	84849
8. Jharkhand	44.66	41.18	4.16	10.00	26385	38.95	30.74	25.27	5.04	28579	56.85	22.51	16.89	3.23	21955
9. Karnataka	40.18	48.39	5.01	6.42	33360	30.31	55.82	6.79	7.08	53465	34.05	50.85	12.37	1.96	60284
10. Kerala	50.27	27.97	3.85	17.91	51060	44.20	29.70	4.84	21.27	71965	56.94	20.31	5.86	16.05	80351
11. Madhya Pradesh	39.16	69.65	15.87	7.06	18236	21.45	64.67	11.79	2.08	37593	29.84	51.67	15.53	2.31	37401
12. Maharashtra	32.44	51.28	5.85	10.43	31409	29.19	52.21	7.30	11.29	44712	37.63	41.31	13.40	7.37	51543
13. Orissa	53.95	31.64	1.51	12.90	13543	34.49	28.28	26.41	10.83	30123	51.82	30.69	8.14	8.78	22928
14. Punjab	29.48	56.90	4.76	8.87	63252	26.46	60.15	9.18	4.21	109321	22.40	47.18	16.69	3.80	119757
15. Rajasthan	62.15	23.97	0.33	13.55	19103	34.48	42.69	13.16	9.66	44494	42.78	29.80	18.82	7.99	56154
16. Tamil Nadu	53.33	31.81	5.31	9.56	26423	41.58	27.46	15.76	15.20	42254	54.49	22.15	16.77	6.00	53481
17. Uttar Pradesh	34.23	51.19	3.25	11.33	20825	23.36	57.99	11.03	7.64	29802	35.98	40.81	16.93	4.80	36155
18. West Bengal	42.66	35.45	3.70	18.18	26512	53.42	24.60	5.65	16.33	24093	55.03	22.88	6.88	13.83	30328
All India	38.72	45.82	4.30	11.16	26971	32.23	47.95	11.87	7.97	38900	39.76	37.17	15.48	6.27	45829

Sources: Same as in Table 1

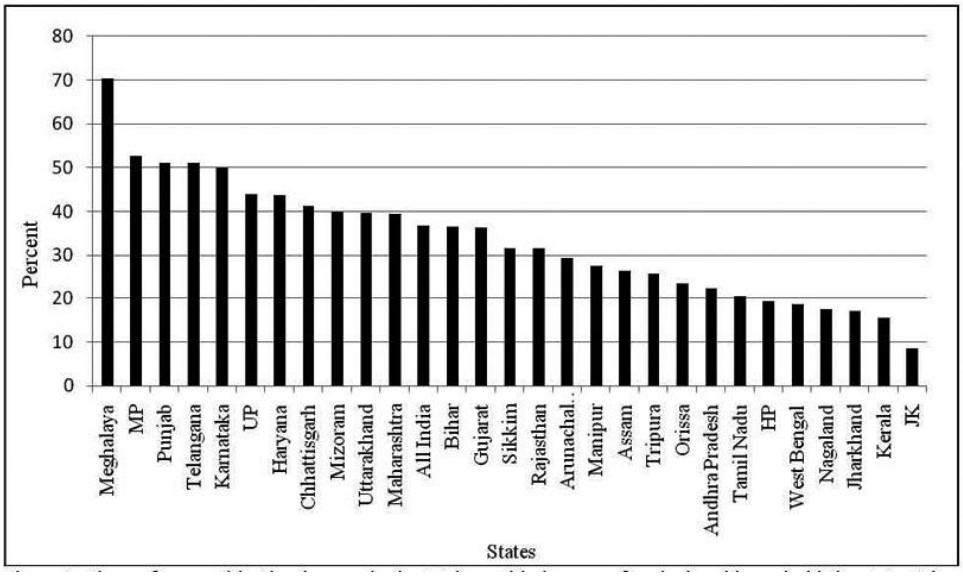

Figure 1. Share of Crop Cultivation Income in the Total Monthly Income of Agricultural Households by State, July 2018-June 2019.

Table 3 presents the state-wise ACGR by source of income. It clearly reveals that the growth pattern in income is widely varied between the two-time points and also across the states. The total annual income of agricultural households registered a growth of 3.39 per cent/annum between 2002-03 and 2012-13, but the same decelerated to 2.37 per cent/annum between 2012-13 and 2018-19 at all-India level. The growth pattern observed at the national level is not the same across the states. Between the period of 2002-03 and 2012-13, a total of 6 states have registered a growth of over 5 per cent/annum, 13 states have registered a growth of over 3 per cent/annum and only in three states, the growth was negative in the total annual of income of farmer households. The same pattern of growth rate is not observed between 2012-13 and 2018-19. Of the 18 states considered for the analysis, only one state (Bihar) registered a growth rate of over 5 per cent per annum, 5 states registered a growth rate of over 3 per cent and 3 states have registered a negative growth rate (see, Table 4). All these clearly suggest that the growth in the annual total income of the farmer households has not only decelerated at the national level but also in most states between 2012-13 and 2018-19.

The growth pattern of income from crop cultivation looks more pathetic as compared to the total income of farmer households. At the all-India level, the crop cultivation income registered a growth of 3.39 per cent per annum between 2002-03 and 2012-13, but it registered a negative growth of -1.29 per cent per annum between 2012-13 and 2018-19. Similar to the national level growth, the state-level growth pattern also shows a dismal picture. Of the 18 states, five states have registered a

TABLE 3. STATE-WISE ANNUAL COMPOUNDGROWTH RATE (PERCENT) OF TOTAL ANNUAL INCOME OF FARMER HOUSEHOLDS BY SOURCE

	Between 2002-03 and 2012-13					Between 2012-13 and 2018-19				
State	Wages	Cultivation	Farming of animals	Non-farm business	Total annual income (Rs.)	Wages	Cultivation	Farming of animals	Non-farm business	Total annual income (Rs.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Andhra Pradesh	5.66	2.36	16.74	1.86	5.15	5.43	0.03	5.03	2.96	3.80
2. Assam	-3.22	1.00	9.41	-6.55	0.05	16.38	-7.63	0.54	10.12	2.41
3. Bihar	2.15	-0.35	-6.11	-5.07	-0.63	4.94	2.43	24.43	5.75	6.66
4. Chhattisgarh	1.95	6.30	10.52	-38.57	3.87	8.60	-0.58	53.88	118.51	4.76
5. Gujarat	2.95	1.64	6.57	2.33	3.12	2.87	1.25	4.21	-4.59	2.40
6. Haryana	2.46	8.69	16.41	-4.91	8.19	7.59	-2.19	1.71	11.53	2.30
7. Jammu & Kashmir	4.89	-4.55	-0.04	1.16	0.85	2.99	-9.98	11.22	1.36	1.44
8. Jharkhand	-0.52	-1.91	18.69	-5.36	0.73	1.65	-7.89	-9.08	-9.64	-3.70
9. Karnataka	1.74	5.74	7.32	5.31	4.38	3.43	0.38	10.83	-15.29	1.73
10. Kerala	1.97	3.73	5.34	4.80	3.17	5.33	-3.78	4.41	-2.42	1.59
11. Madhya Pradesh	1.11	6.08	3.95	-4.45	6.80	4.75	-3.22	3.94	1.48	-0.07
12. Maharashtra	2.28	3.43	5.36	4.01	3.26	5.82	-1.31	11.31	-3.98	2.05
13. Orissa	3.25	6.44	39.52	5.84	7.54	1.94	-2.69	-18.71	-6.66	-3.82
14. Punjab	4.08	5.63	11.57	-1.79	5.10	-1.07	-2.14	10.34	-0.16	1.31
15. Rajasthan	2.36	13.81	50.81	4.72	7.99	6.62	-1.80	8.80	0.61	3.38
16. Tamil Nadu	2.02	2.98	15.21	8.86	4.36	7.50	0.29	4.35	-9.45	3.42
17. Uttar Pradesh	-0.22	4.49	15.46	-0.33	3.31	9.34	-2.23	9.29	-3.80	2.80
18. West Bengal	1.18	-4.11	3.02	-1.83	-0.87	3.78	2.28	6.28	0.91	3.34
All India	1.67	3.81	13.38	0.27	3.39	5.49	-1.29	6.32	-1.07	2.37

Sources: Same as in Table 1

TABLE 4. CLASSIFICATION OF ANA AND BNA STATES IN TERMS OF ANNUAL COMPOUND GROWTH RATE (PERCENT) IN TOTAL ANNUAL INCOME OF FARMER HOUSEHOLDS

(at 2004-05 prices)

Classification (1)	Between 2002-03 and 2012-13 (2)	Between 2012-13 and 2018-19 (3)
States with Above National Average Growth Rate	Andhra Pradesh, Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu	Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Rajasthan, Tamil Nadu, West Bengal.
States with above 5per cent Growth Rate	Andhra Pradesh, Haryana, Madhya Pradesh, Orissa, Punjab, Rajasthan.	Bihar
States with above 3 per cent Growth Rate	Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh.	Andhra Pradesh, Bihar, Chhattisgarh, Rajasthan, Tamil Nadu, West Bengal.
States with Negative Growth Rate	Bihar, West Bengal	Jharkhand, Madhya Pradesh, Orissa
Average Growth Rate for All-India	3.39 per cent	2.37 per cent

Sources: Same as in Table 1.

growth of over 5 per cent in crop cultivation income, 10 states have registered a growth of over 3 per cent and four states have registered a negative growth between 2002-03 and 2012-13. This pattern of growth has completely changed between 2012-13 and 2018-19, where not even a single state registered a growth of 3 or 5 percent (see, Table 5). Shockingly, as many as 12 states have registered negative growth rate in crop income which is not observed in any source of income. What is worrying is that the agriculturally advanced states like Punjab (-2.14 per cent), Haryana (-2.14), Andhra Pradesh (0.03 per cent) and Tamil Nadu (0.29 per cent) have registered either a negative growth or a very poor growth in crop cultivation income. This in a way suggests as to why the farmers from developed states are also expressing voices of distress in recent years.

TABLE 5. CLASSIFICATION OF ANA AND BNA STATES IN TERMS OF ANNUAL COMPOUND GROWTH RATE (PERCENT) IN NET INCOME FROM CROP PRODUCTION OF FARMER HOUSEHOLDS

(at 2004-05 prices)

Classification (1)	Between 2002-03 and 2012-13 (2)	Between 2012-13 and 2018-19 (3)
States with Above National Average Growth Rate	Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh.	Andhra Pradesh, Bihar, Chhattisgarh Gujarat, Karnataka, Tamil Nadu, West Bengal.
States with above 5 per cent Growth Rate	Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Orissa, Punjab, Rajasthan.	---
States with above 3 per cent Growth Rate	Chhattisgarh, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.	---
States with Negative Growth Rate	Bihar, Jammu & Kashmir, Jharkhand, West Bengal.	Assam, Chhattisgarh, Haryana, Jammu & Kashmir, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh.
Average Growth Rate for All-India	3.81 per cent	-1.29 per cent

Sources: Same as in Table 1.

Unlike the crop cultivation income, the income from wages and farming of animals registered an annual growth of 5.49 per cent and 6.32 per cent respectively between 2012-13 and 2018-19 at the national level. Similar to the national level growth, almost all the states considered for the analysis have also registered a reasonably good growth rate in these two sources of income. In wage income, a total of 9 states have registered a growth of over 5 per cent and 12 states have registered a growth of over 3 per cent. In the category of income received from farming of animals, a total of 9 states have registered a growth of over 5 per cent and 13 states have registered a growth of over 3 per cent. Why this kind of growth rate could not be registered in the crop income of farmer households is a serious question which one must study using more disaggregated data. In any case, but for the income from wages and farming of animals, the total annual income of farm households would have decelerated considerably in 2018-19 over its previous period.

IV

DETERMINANTS OF FARMER HOUSEHOLDS INCOME

One of the major objectives of the study is to find out the determinants of the total monthly income as well as the monthly crop cultivation income of the farmer households. It is observed from the above that the income of farmer households is not the same across the states. Some states have much higher income in both total annual income and also in crop cultivation income, while many other states have less income in these sources than the national average. Many states have also registered a negative growth in the crop cultivation income during 2018-19 over its previous period 2012-13. Why do the variations exist in income? Is it due to economic factors or social factors? Which are the important factors that determine the income of the farmer households? In order to answer these questions, two separate regressions (OLS method) have been estimated treating total monthly income of agricultural households and net income from crop cultivation as dependent variable. The regressions have been estimated using SAS data only for the year 2018-19 as it has income and other related-data for as many as 28 states with many important variables associated with the farm households. The descriptive statistics of the variables included in the two regression models are presented in Table 6, which are self-explanatory.

Determinants of Total Monthly Income of Farmer Households:

As mentioned earlier, the total monthly income of the farmer households includes five different sources including the crop production income. Changes in any of the sources of income can increase or decrease the total monthly income. The results of the regression estimated treating the total monthly income of agricultural households as a dependent variable are presented in Table 7. The variables included in the regression model seem to be appropriate as the value of R^2 turns out to be 0.70, meaning

TABLE 6. KEY PARAMETERS OF THE FARMER HOUSEHOLDS USED IN THE ANALYSIS FOR 28 STATES

Variable	Description	Unit	Average	Standard deviation	Correlation with	
					TMIA	MICP
(1)	(2)	(3)	(4)	(5)	(6)	(7)
AAOH	Average area owned per household excluding landless households	ha	0.56	0.32	0.15ns	0.25ns
AGCA	Average gross cropped area per farmer household	ha	0.832	0.45	0.37c	0.41b
AHRC	Share of agricultural households to total rural households	Per cent	54.0	14.13	0.13ns	0.17ns
AHTA	Share of agricultural households accessed technical advice	Per cent	45.45	18.34	-0.07ns	-0.25ns
AICP	Share of agricultural households involved in crop production	Per cent	68.90	12.27	-0.21ns	0.25d
ARCP	Share of agricultural households reporting crop production	Per cent	82.60	11.70	0.18ns	0.05ns
ESFP	Share of expenditure on seeds, fertiliser and plant protection in the total monthly expenditure on crop production	Per cent	37.20	9.15	-0.13ns	-0.01ns
HPLO	Share of agricultural households possessing land less than 1.00 ha	Per cent	70.40	16.56	-0.21d	-0.29d
LTAH	Literacy rate of agricultural households among persons age 7 years and above	Per cent	73.60	9.52	0.50a	0.33c
MECP	Monthly expenditure on crop production	Rs.	3739	3300.48	0.38b	0.44b
MICP	Monthly income (net receipt) from crop production	Rs.	3058	3645.44	0.81a	1
MIFA	Monthly income (net receipt) from farming of animals	Rs.	441	923.02	0.17ns	-0.03ns
MINF	Monthly income (net receipt) from non-farm business	Rs.	641	1108.20	0.41b	0.003ns
MIWA	Monthly income from wages per agricultural household	Rs.	4063	2296.21	0.61a	0.18ns
OBCH	Share of agricultural households belonging to other backward classes	Per cent	45.80	21.30	-0.46b	-0.35c
PIRA	Share of irrigated area to cropped area	Per cent	50.05	24.59	0.17ns	0.29d
PTHT	Share of tenant holdings	Per cent	17.30	11.32	-0.36c	-0.23ns
SCST	Share of agricultural households belonging to SC and ST community	Per cent	30.10	25.84	0.21ns	0.30d
TMIA	Total monthly income per agricultural household	Rs.	8337	5218.55	1	0.82a

Source: Computed from NSSO-SAS (2021).

Notes: a, b, c and d are significant at 1, 5, 10 and 20 percent level respectively; ns - not significant.

that the variables included in the regression model explain about 70 per cent of the variation in total monthly income of farmer households. Of the six independent variables, as expected, the coefficients of variables such as the average literacy rate of agricultural households among persons age 7 years and above (LTAH), percentage of

irrigated area to cropped area and monthly expenditure (Rs.) on crop production (MECP) turned out to be positive and significant in impacting the income of agricultural households. The literacy rate of farm households is very important for modern agriculture because it helps these farmers to adopt modern inputs and technology in crop cultivation, allows having better outside contacts and also helps realise better prices for their commodities in the market through an improved bargaining power with the market agents (Tilak, 1993; Narayanamoorthy, 2000). The implication of the coefficient of the LTAH variable is that a one per cent increase in literacy rate of farmer households can increase their annual income by about Rs. 435 per month, while holding all the other independent variables constant. The present day modern agriculture is cost-intensive and therefore, without incurring increased expenditures on account of crop production, the income from farming cannot be increased. Therefore, on the expected lines, the value of the coefficient of MECP turned out to be positive and significant, implying that a one rupee increase in the monthly expenditure on account of crop production can generate about Rs.0.61 in the total monthly income of farm households.

TABLE 7.. REGRESSION RESULTS (OLS METHOD) – FACTORS DETERMINING THE TOTAL MONTHLY INCOME AND MONTHLY NET CROP PRODUCTION INCOME OF FARMER HOUSEHOLDS

		Dependent Variable	
Variables	Description	TMIA	MICP
(1)	(2)	(3)	(4)
1. AHTA	Percentage of agricultural households accessed technical advice	-89.12 (-2.04)c	-77.01 (-3.15)a
2. AICP	Share of agricultural households involved in crop production (per cent)	-176.01 (-2.15)b	49.45 (1.08)ns
3. HPLO	Share of agricultural households possessing land less than 1.00 ha (per cent)	-168.23 (-2.44)b	-60.87 (-1.57)d
4. LTAH	Literacy rate of agricultural households among persons age 7 years and above (per cent)	435.27 (5.08)a	291.23 (5.47)a
5. MECP	Monthly expenditure on crop production (Rs)	0.61 (1.56)d	0.57 (2.59)b
6. PIRA	Share of irrigated area to cropped area (per cent)	62.99 (1.32)d	37.24 (1.40)d
7. ESFP	Share of expenditure on seeds, fertiliser and plant protection in the total monthly expenditure on crop production (per cent)	---	142.11 (2.85)a
Constant	---	1376.63 (0.12)	-23337.33 (-3.29)a
R2	---	0.70	0.76
Adjusted R2	---	0.62	0.68
F Value	---	8.30	9.05
D-W Statistics	---	1.95	1.96
N	---	28	28

Source: Estimated using data from NSSO-SAS (2021).

Notes: a, b, c and d are significant at 1, 5, 10 and 20 percent level respectively; ns - not significant; figures in parentheses are 't' values.

Since irrigation is a paramount factor in determining the income of farmer households (Dhawan, 1988; Narayanamoorthy *et al*., 2015), the percentage of irrigated area to the cropped area was specifically included as an independent variable along with other variables in the regression model. It should be underlined here that somehow SAS report did not publish the irrigation-related data for the farmer households and therefore, this data was compiled from the source of 'Land Use Statistics at a Glance' (Government of India, 2021) published by the Ministry of Agriculture and Farmers Welfare, Government of India. The irrigation variable PIRA turned out to be positive and significant in impacting the farmers' income. This is expected because of that the improved irrigation coverage helps the farmers not only to harvest higher output from different crops but also help them to cultivate high value crops which ultimately help to increase the income of farmer households (Narayanamoorthy, 2021).

On the expected lines, the coefficient of the variable AICP turned out to be negative and significant in impacting the total monthly income of farmer households. The negative coefficient of AICP implies that when the percentage of agricultural households involved in crop production to the total self-employment of the agricultural household increases, there is a possibility of reduction in the income (coefficient value is -168.23) because of the fact that the income earned from other sources for those households will be lower. This is plausible given the increased income realised by the farm households from the non-crop husbandry income sources such as wages and farming of animals particularly in 2018-19, which is also clearly highlighted in the previous section of the paper. The correlation value computed to ascertain the relationship between the dependent and independent variables included in the regression model also shows a weak relationship between AICP and TMIA (see, Table 6).

The land holding of farmer households is an important determinant of the farmers' income in the era of modern agriculture, though the literature on the relationship between farm size and productivity shows mixed results (Athreya *et al*., 1986; Das, 2021). The marginal farmers owning less than one hectare always have some difficulties in adopting the cost-intensive modern inputs in crop cultivation which is expected to affect their income generation. Given this, we have expected that the variable HPLO would negatively and significantly impact the farmers' income. As expected, the variable HPLO is turned out be negative and significant, implying that land size class is positively related with the income of the farmer households. This is also very clearly reflected from the SAS data of 2018-19, where the level of income of farmer households increases along with land size class (see, Figure 2). Surprisingly, the variable percentage of agricultural households accessed to technical advice (AHTA) did not turn out to be positive and significant. This probably means that the farmers are no longer needed the conventional technical advice for crop production (which has already reached almost all the farmers) but what they need is more quality advice on the prices and market environment to increase their income. On the whole,

the regression results suggest that the literacy rate, percentage of irrigated area to cropped area and the total expenditure incurred on crop production appear to be the important determinants of the total monthly income of agricultural households.

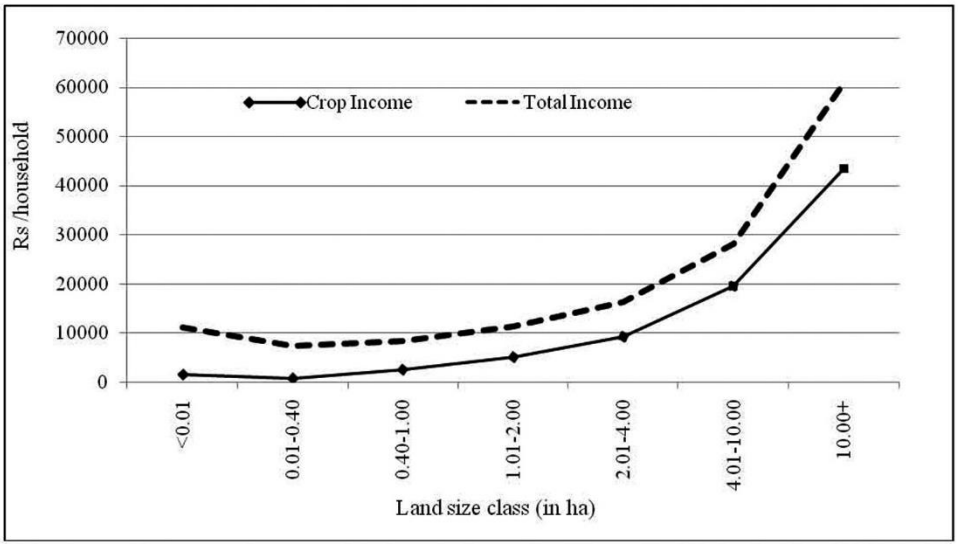

Figure 2. Trends in Average Monthly Net Crop Income and the Total Monthly Income Per Farmer Household by Land Size Class, July 2018 – June 2019.

Determinants of Monthly Net Crop Production Income:

The income from crop cultivation or production is the major source of income for farmer households. Therefore, besides studying the determinants of the total monthly income of farmer households, the determinants of the net crop cultivation income has also been studied using regression analysis. In this analysis, in addition to 6 variables used in the regression model (1), one more variable namely ESFP (percentage of expenditure on seeds, fertiliser and plant protection to total monthly expenditure on crop production) has been included. This variable has been included in the regression model because of the reason that the yield increasing inputs such as seed, fertiliser and pesticides are proved to be the important determinants of crop productivity especially after the introduction of green revolution in Indian agriculture (Bhalla and Singh, 2009).

The regression results estimated treating monthly crop production income of agricultural households (MICP) as dependent variable are almost matching with the results which are estimated treating total monthly income of agricultural households as a dependent variable (see, Table 7). Overall, the high R^2 value of the model (2) explains the goodness of fit, meaning that the variables included in the model explains the variation in MICP as much as 76 per cent. Among the seven independent variables, the

variables such as LTAH, PIRA and MECP have positively and significantly influenced the net income from crop production, which is also observed in model (1). The coefficient of the variable AICP (percentage of agricultural households involved in crop production) turned out to be positive and insignificant in determining the MICP, but it was negative and significant in determining the TMIA. The coefficient of the land holding variable HPLO has significantly and negatively impacted the MICP. The implication of this coefficient is that if the share of farmer households possessing land less than one hectare increases, the crop production income of such households would go down.

On the expected lines, the additional variable ESFP (percentage of expenditure on seeds, fertiliser and plant protection to total monthly expenditure on crop production) included in model (2) is turned out to be positive and significant in determining MICP. The coefficient value of ESFP implies that one percent increase in it can increase the net income from crop production by about Rs. 142 per month. Interestingly, the magnitude of coefficient of ESFP is also much bigger than the coefficient of total monthly expenditure on crop production (MECP). This is expected because of the fact that the increased expenditure on yield increasing inputs would increase the productivity of crops which in turn helps to realise more income from crop cultivation. In sum, the regression results estimated treating MICP as dependent variable suggest that besides monthly expenditure of crop production and share of expenditure on yield increasing inputs, literacy level and the percentage of irrigated area to cropped area appear to have played significant role in impacting the net crop production income of farmer households.

V

CONCLUSION AND POLICY POINTERS

An attempt has been made in this study to analyse the trends and determinants of the farmer households' income using SAS data of three time points namely 2002-03, 2012-13 and 2018-19. The study shows that although the total monthly income at constant prices per farmer household has increased from Rs. 26,971 in 2002-03 to Rs. 45,829 in 2018-19, it varies widely across the states in all the three time points. States like Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal continue to have the income level less than the national average in all the three-time points. The analysis of growth rate shows that the total annual income of agricultural households decelerated to 2.37 per cent/annum between 2012-13 and 2018-19 as compared to the period between 2002-03 and 2012-13 (3.39 per cent/annum) at the all-India level. The growth pattern of the total annual income is also not very appreciable among the states between 2012-13 and 2018-19.

The growth pattern of income from crop cultivation looks more pathetic as compared to the total income of farmer households. At the all-India level, the crop cultivation income registered a growth rate of 3.39 percent per annum between 2002-

03 and 2012-13, but it registered a negative growth of -1.29 percent per annum between 2012-13 and 2018-19. The state-level growth pattern also shows a dismal picture; as many as 12 states have registered negative growth in crop income, which is not observed in any source of income. The agriculturally advanced states like Punjab (-2.14 per cent), Haryana (-2.14 per cent), Andhra Pradesh (0.03 per cent) and Tamil Nadu (0.29 per cent) have registered either a negative growth or a very poor growth in crop cultivation income between 2012-13 and 2018-19.

The regression analysis carried out to find out the determinants of the total monthly income of farmer households suggests that the average literacy rate of farmer households, total expenditure incurred on crop production and the percent of irrigated area to cropped area appear to be the important determinants of the total monthly income of agricultural households. Similarly, the regression analysis carried out to find out the determinants of monthly net income from crop production also shows that the average literacy rate, the percent of irrigated area to cropped area, total expenditure incurred on crop production and the share of expenditure on yield increasing inputs are the important factors. The strong relationship between the literacy rate and income of the farm households suggests the importance of increasing formal literacy rate of the farmers to have increased income; it helps to adopt the modern inputs in crop cultivation and also allows them to bargain diligently with the market agents. While the data on farmers' literacy rate is very useful, it will be useful if data on farmers' awareness about the price and market environment are published by SAS report to relate them with the income level of farmer households. The positive and significant coefficient of irrigation variable suggests that there is a need to expand the irrigation facility wherever possible to increase the income of farmer households. The increased expenditure on yield increasing inputs (seed, fertilizer and pesticides) has played an important positive role in increasing the income. Therefore, appropriate steps need to be taken to increase the application of yield increasing inputs in crop cultivation wherever required.

Importantly, the policy makers must also realize that with this pathetic income level from crop cultivation, it will be very difficult to double the farm income by 2022-23, which was envisaged in 2015-16 by the Government of India (Chand, 2017; Narayanamoorthy, 2021). It will also be difficult to retain farmers to remain in farming with this poor income. Already the report of NSSO-SAS (2005) revealed that 40 per cent of the farmers were willing to quit agriculture and take up some other career because of poor income from farming (Birthal *et al*., 2015). Although this important data has not been published in the latest SAS data of 2018-19, there is every possibility that this percentage may have increased by now. Potentially, this poor income from farming can harm the growth of agriculture and food security of the country as well. Although the present government has been giving top priority to increase farm income through various interventions/programmes, the SAS data shows a sharp deceleration in farm income in 2018-19 over its previous period 2012-13. Studies show that farmers were not able to get even one-fifth of the money that the consumer pays for various

agricultural commodities in the market (for more details on this see, Government of India, 2017). Therefore, many price and market-related interventions are needed to increase the farm income in the future.

Although the central government has been increasing the MSP for different crops every year, the mere announcement of MSPs would not help the farmers to augment their income unless procurement infrastructure is strengthened. As per the SAS data of 2018-19, except for paddy and wheat, where the percentage of output sold under MSP varies from 20-24 per cent, the procurement level in pulses, oilseeds, nutria-cereals, cotton, etc. are very poor. The 'High Level Committee on Reorienting the Role and Restructuring of Food Corporation of India' has strongly suggested on widening of procurement mechanism (Government of India, 2015). Therefore, efforts should be made to procure 20-25 per cent of production in each mandated crop to increase the income of the farmers.

The negative and significant regression coefficient of percentage of farmer households owning land less than one hectare suggests that the income of marginal farmers would go down, if their numbers increase in any state in India. This could be due to their poor bargaining power in the farm producers market, where they are always the losers. In order to protect such small holders from the market irregularities, procurement of crops by state agencies is necessary. But the SAS data of 2012-13 shows that because of non-availability of procurement centres, farmers are not able to avail MSPs. Except a few regions and few crops, this has been happening across India, which is also evident from the SAS data of 2018-19. Therefore, procurement infrastructures must be strengthened. Through the 'Pradhan Mantri Annadata Aay SanraksHan Abhiyan' (PM-AASHA) scheme, the central government provides incentives to state governments for three schemes namely (1) Price Support Scheme (which promises to provide assured price for farmers and protect them from making distress sales during bumper harvest), (2) Price Deficiency Payment Scheme (which provides compensation when market prices go below MSP) and (3) Private Procurement Stockist Scheme (which allows the entry of private players in the procurement of oilseeds on a pilot basis). State governments must come forward and implement these schemes with full spirit to increase the procurement level of different crops to increase the income of farmer households.

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