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Can better market access lead to higher incomes for farmers?

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Abstract This study constructs a multi-dimensional index of market access, considering market orientation of commodities, market channels and market information. The findings show that better access to markets improves returns from farming. With respect to the composite index of market access, the elasticity of net farm income is 0.359 and of gross farm income is 0.316. With one percentage point improvement in market access the net income rises by Rs. 392 and gross income by Rs. 764. Further it demonstrates that even if the minimum support price policy is implemented uniformly across the country, improving market access remains important for enhancing farm incomes.

Keywords Market access, farm income, impact, price policy, India

JEL classification Q110, Q130, Q180

1 Introduction

Farmers expect remunerative prices for their produce though, sometimes – due to market imperfections and demand-supply imbalances, for instance – they have to sell it at a price that does not cover their production cost. If prices fall below minimum support price (MSP), the Government of India can buy any quantity of a crop from farmers to protect them from income loss. But the MSP is notified only for 23 crops and very few farmers know about the MSP and procurement agencies (GOI 2014a; Aditya et al. 2017); and the price support mechanism is available only for a few crops, notably paddy and wheat, and that too in a few states like Punjab and Haryana (Chand 2003). The factor–credit–output market interlinkages force farmers to accept the prices offered in the existing market channels. Formal agencies (regulated markets, government procurement agencies and cooperatives) are governed poorly and are rife with malpractices, and sales to them are not always remunerative (Negi et al. 2018; Chatterjee & Kapur 2016). Considering the cost of transport involved in selling to distant markets, selling to local traders could be a rational decision.

What explains differential price realization by farmers, then? The important explanatory factors seem to be better access to market and effective bargaining power. Price realization is influenced strongly by farm size, volume of marketable surplus and socio-economic status (that define bargaining power) and distance to markets (that defines market access).

Market access is often defined through a single indicator, mostly physical dimensions such as the distance to market or transport cost, but a few studies define market access as a composite index based on several indicators that explain variations in price. Based on a literature survey, Chamberlin and Jayne (2013) conclude that market access has multiple dimensions (e.g., infrastructure and institutions) that cannot be reduced to a single index easily, and they recommend a more nuanced conceptualization of market access. Their study considers market access in terms of distance to various institutions (e.g., fertilizer retailer) and infrastructural facilities (e.g., motorable road). Restricting the scope of market access to mere physical distance from a 'market' is a limitation in this approach.

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In this study, we propose an alternative framework based on a functional definition of market access encompassing the market orientation of commodities, market channels and market information. We argue that in influencing farmer income, market access is more important than the MSP mechanism, extending which has huge welfare and financial implications (IRADe, 2007). We, therefore, propose to

- measure the degree of market orientation and farmers' awareness of the MSP and the procurement system;
- define and quantify farmers' access to markets by building a composite index that combines dimensions like market orientation, choice of the marketing agency and market information; and
- assess the effect of market access on farm income.

2 Data and methodology

2.1 Data

We analyse the relationship between market access and farmer income based on the data from the 70th round of the NSSO Situation Assessment Survey conducted during 2012-13. To cull the required data, we use four reports of the NSSO survey:

- Key Indicators of Situation of Agricultural Households in India, 2014 (NSS KI 70/33) (GoI, 2014a);
- Key Indicators of Land and Livestock Holdings in India, 2014 (NSS KI 70/18.1) (GoI, 2014b);
- Some Aspects of Farming in India (Report No. 573:70/33/2-2016) (GoI, 2016b); and,
- Income and Expenditure, Productive Assets and Indebtedness of Agricultural Households in India (Report No: 576:70/33/3-2016) (GoI, 2016c).

The data compiled for the study include

- net and gross income from crops per household;
- cost of cultivation;
- proportion of households reporting the sale of crops to different agencies;
- proportion of households reporting awareness of the MSP and procurement agencies;
- proportion of households selling at the MSP and through procurement agencies;
- share of Scheduled Castes (SC) and Scheduled Tribes (ST) households in total agricultural households; and the
- cropped area per household.

We used suitable weights to aggregate the data on different crops and seasons at the state level. We covered 19 states (excluding the north-eastern states, smaller states and union territories) and 26 crops (excluding sugarcane, coconut and barley). We use household-level data aggregated at the state level for the analysis. We use the terms 'agricultural household' and 'farmer' interchangeably.

2.2 Measuring market access

Farmers' access to markets is a multi-dimensional concept covering three dimensions: market orientation, market agency choice and market information.

The market orientation covers household participation in sales and the marketable and marketed surplus. The market agency dimension measures the degree of engagement of farmers with the formal marketing system. Awareness about MSP and other such information is covered under the market information dimension.

We use three indicators for each of these three dimensions and we combine these nine indicators into a composite index of market access that we term the Farmers' Access to Markets Index (FAMI). These indicators are defined below.

1. Market orientation (MO)

a. Proportion of households reporting sales (%). It measures the breadth of market orientation.

b. Total quantity sold per household reporting sales (quintal/household). It measures the depth of market orientation.

c. The ratio of the production value to the cultivation cost (%). It indicates surplus over cost (in a way, marketable surplus); higher the surplus, higher the propensity to sell in the market.

2. Market agency choice (MC)

a. Proportion of households selling to formal agencies (i.e., other than local traders at farm gate)

(%). Higher the proportion, better the market access.

b. Proportion of quantity sold to formal agencies (%). A higher value implies better price realization.

c. Proportion of households expressing satisfaction with the agency they sold to (%).

3. Market information (MI)

a. Proportion of households aware of the MSP (%), measured as the maximum awareness level recorded for any crop in a given state.

b. Ratio of the maximum proportion of households showing awareness of procurement agencies for any crop to the maximum proportion of households selling to procurement agencies (%).

c. Proportion of sale to procurement agency (%). Higher value indicates higher level of information assimilation.

The indicators are converted into indices bounded between 0 and 1 using the formula:

Index = (actual value – minimum value)/(maximum value - minimum value)

The indicators for each dimension combined to generate a specific index using equal weights and then we calculate geometric mean of the three indices to form a composite index of farmers' access to market (FAMI):

$$FAMI = (MO \times MC \times MI)^{1/3}$$

A simple regression model is used to explore the relation between farm income per annum per household and FAMI. We describe the variables at the appropriate places in the paper.

3 Market access of agricultural households

3.1 Market orientation

Around 50% of the total agricultural households reported cultivating paddy in the kharif season and 9.4% in the rabi season, while 39.1% reported cultivating wheat in the rabi season (table 1). The proportion of agricultural households reporting sales of one or the other crop varied from 31% to 90%. A smaller proportion of households cultivating cereals, pulses and potatoes sold their crops. A relatively higher proportion of households cultivating commercial crops and oilseeds and rabi maize reported their sales. The unsold proportion may have been sold at a later stage or retained for own consumption for seed, feed and human consumption. The data suggest that kharif food grains are grown primarily for home consumption and non-food grain crops and rabi food grains are grown for the market.

Table 1. Details of agricultural households cultivating and selling major crops

Crop	% HH reported cultivation	% HH reported sale	Estimated quantity sold (million tonnes)	% harvested quantity sold	Quantity sold/ HH (Qtl)
Kharif					
Paddy	49.7	41.6	47.4	51.7	25.39
Jowar	5.4	31.1	1.8	27.0	11.92
Maize	10.5	36.4	5.0	65.9	14.45
Groundnut	2.6	66.2	1.2	81.1	7.74
Soybean	5.5	90.2	5.9	80.1	13.11
Cotton	7.1	89.6	8.6	88.2	15.03
Rabi					
Paddy	9.4	64.5	15.5	69.1	28.39
Maize	3.0	72.4	5.2	87.0	26.53
Wheat	39.1	36.9	29.8	48.2	22.92
Gram	6.7	54.7	2.5	67.6	7.53
Potato	5.2	52.6	8.9	73.4	36.03
Rapeseed and mustard	8.9	45.0	2.5	65.7	6.91

Source: GoI (2016b)

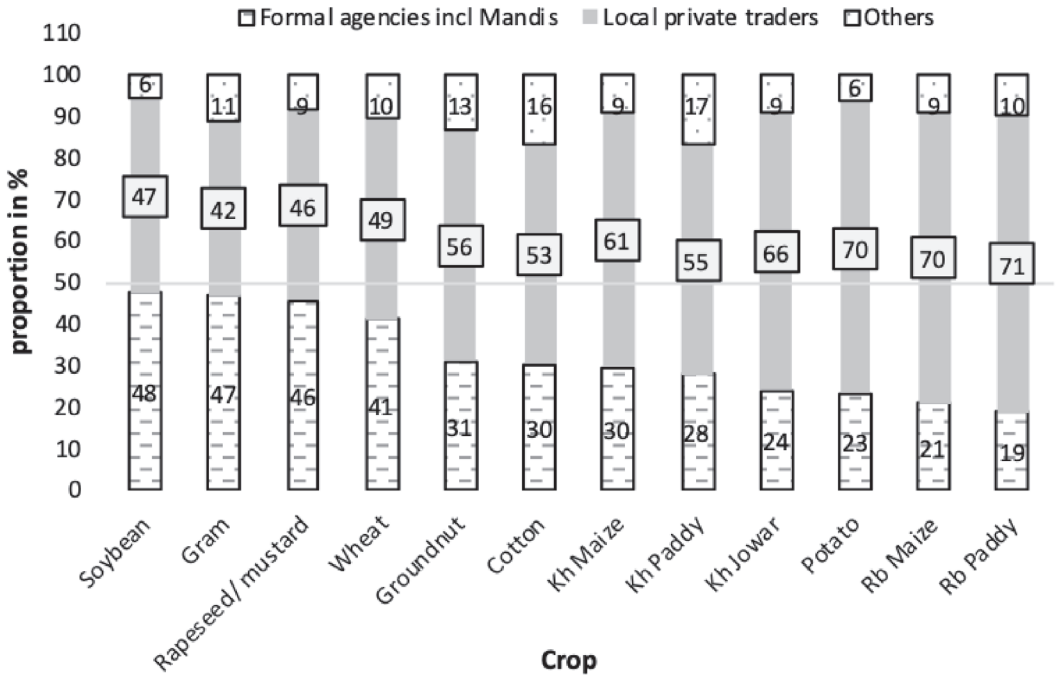

Figure 1. Distribution of HH according to marketing agency

3.2 Marketing agency choice

Most farmers, being predominantly smallholders, sell immediately after harvest when the prices are usually low due to huge market arrivals. In such a situation, *a priori*, it is rational for producers to sell in regulated markets (mandis) or to cooperative agencies/ government procurement agencies that may ensure better prices. However, most households (42-71%) prefer selling their produce to local traders (figure 1). This behaviour may seem counter-intuitive, but such preference has many reasons: few farmers can afford proper storage; mandis are often at a distance, and the cost of transport is high, as is access to information; problems of mandis- such as poor network, inadequate infrastructure, poor governance, malpractices, and lack of guarantee to ensure MSP or higher prices; and the transaction costs of selling to local private traders are lower (Chatterjee & Kapur 2016; Negi et al. 2018). However, crops like soybean and gram are sold mainly to formal marketing agencies. For instance, about 60% of the soybean is sold to formal marketing agencies. Jowar is sold predominantly to local traders. Among rabi crops, nearly 64% of paddy and maize and 74% of potatoes are sold to local private traders (table 2).

Small farmers often sell a higher proportion of their produce to local traders while large farmers sell mostly to formal agencies. Overall, about 72% of the households reporting sales are satisfied with the agency they sold their produce to (table 3). About 24% of households not satisfied reported having received less

Table 2. Distribution of quantity sold through different channels (%)

Crop	Formal marketing agencies	Local private traders	Others	Total
Kharif				
Paddy	46	41	13	100
Jowar	17	76	7	100
Maize	41	46	13	100
Groundnut	33	44	23	100
Soybean	60	36	4	100
Cotton	34	49	17	100
Rabi				
Paddy	23	64	13	100
Maize	31	64	5	100
Wheat	64	29	7	100
Gram	65	30	5	100
Potato	22	74	4	100
Rapeseed & Mustard	64	32	4	100

Table 3. Proportion of households satisfied or otherwise by selling to various agencies

Season/ crop	Sold to local traders			Sold to traders in *mandi*			All agencies		
	% HH satisfied	% HH received < market price	% HH reporting malpractices	% HH satisfied	% HH received < market price	% HH reporting malpractices	% HH satisfied	% HH received < market price	% HH reporting malpractices
Kharif									
All sizes	64.8	32.3	2.9	75.0	20.9	4.1	68.0	27.8	4.2
Cereals	67.2	29.6	3.2	76.5	19.8	3.7	70.4	25.6	4.0
Pulses	58.5	38.6	3.0	69.4	22.4	8.3	63.3	30.9	5.8
Oilseeds	59.3	39.3	1.4	73.7	23.9	2.5	65.3	32.3	2.4
Commercial crops	61.0	35.1	3.9	67.9	25.9	6.2	62.7	32.2	5.1
Rabi									
All sizes	74.9	22.1	3.0	85.3	12.6	2.2	76.2	20.4	3.4
Cereals	75.6	20.8	3.6	87.4	10.0	2.6	77.0	19.0	4.0
Pulses	74.4	24.1	1.5	80.8	18.2	1.0	73.4	25.3	1.3
Oilseeds	75.8	23.3	0.9	91.6	7.6	0.9	80.9	16.6	2.5
Commercial crops	69.1	26.5	4.4	68.9	27.5	3.6	68.4	27.3	4.3
Overall	69.2	26.9	3.9	79.2	16.5	4.4	71.6	23.8	4.6

than the prevailing market price and 4.6% reported malpractices such as faulty weighment and loan deduction. Relatively, proportion of satisfied households is greater among those selling to formal agencies compared to those who sell to local traders. Interestingly, the proportion of satisfied households at 69% among those selling to local traders is no way lower. The problems reported by the households not satisfied are the lower-than-market price, delay in payment, deduction of loan amount from sale proceeds and faulty weighing.

Selling to formal agencies reduces the chance of being paid a lower-than-market price. More households selling rabi crops are satisfied than those selling kharif crops irrespective of the market agency. On an average, the proportion of households satisfied with any agency is higher among those selling rabi oilseeds (80.9%), followed by those selling other rabi crops like cereals, pulses and commercial crops (including potato and cotton). For kharif crops, satisfaction is higher in the case of cereals (70.4%) followed by oilseeds, pulses, commercial crops.

We estimate a regression equation to understand the factors that determine satisfaction level (table 4). From the regression results in Table 4, we estimate the overall satisfaction (table 5). About 71% of the agricultural households growing kharif cereals and selling to local traders were satisfied, and a little less than 80% of the households growing kharif cereals were satisfied with mandi traders. Only 55% of the households selling kharif commercial crops to local traders was satisfied, and the highest satisfaction is reported for the sale of rabi vegetables in mandis.

3.3 Market information/awareness

The awareness about the MSP and procurement agencies is relatively low (Table 6): hardly 33% of those who sold their kharif and rabi paddy are aware of the MSP; a little less than 67% of wheat sellers are aware of the MSP; 25% of those who sold kharif paddy are aware of procurement agencies, and only 13.5% sold to these; and about 35% of households selling wheat are aware of procurement agencies and 16.2% sold to these. Of all the farmers who sold their produce to procurement agencies, only 27% realized the MSP for kharif paddy, 35% for kharif wheat and 14% for rabi paddy. There is hardly any awareness about the MSP or procurement agencies for other crops.

Table 4. Factors influencing proportion of HH expressing satisfaction with a marketing agency

Variable	Description	Coefficients	Standard error	*t*-Stat	Level of significance
Dependent variable: % HH expressing satisfaction with marketing agency					
Intercept	% HH selling *kharif* cereals to local traders, satisfied	70.61	3.14	22.5	***
Agency	Local traders=0; mandi=1	9.10	2.86	3.18	***
Season	Kharif=0, rabi=1	6.73	2.91	2.31	***
Pulse	Cereals=base category; pulses=1	-12.18	3.69	-3.30	***
Oilseeds	Oilseeds=1	-7.49	4.38	-1.71	**
Veg	Vegetables=1	5.76	6.01	0.96	NS
Comm_crop	Commercial crops=1	-15.96	4.87	-3.28	***
	R^2= 0.18	*F*=5.32282***	No. of observations = 156		SE =17.79

*** and ** Significant at 1% and 5% level, respectively. NS = not significant.

Table 5. Proportions of households reporting satisfaction

Crop	Sold through			
	Local traders		Mandi traders	
	Kharif	Rabi	Kharif	Rabi
Cereals	70.6	77.3	79.7	86.4
Pulses	58.4	65.2	67.5	74.3
Oilseeds	63.1	69.9	72.2	79.0
Vegetables	76.4	83.1	85.5	92.2
Commercial crops	54.7	61.4	63.8	70.5

A NITI Aayog study (GoI 2016a) corroborates these findings. Even where awareness about the MSP is high, farmers do not know the MSP of crops they grow before the season, thus making their awareness redundant. If farmers know the MSP in advance, they can plan their crop better, but it need not lead to higher prices if they sell immediately after the harvest. Even among those selling to procurement agencies – barring paddy and wheat growers, of whom respectively 27% and 35% sold at the MSP – farmers could hardly sell at the MSP. The MSP is realized for a few crops and fewer

Table 6. Proportion of HH out of those who reported sales having awareness of MSP and procurement agency (PA)

Crop	% HH aware of MSP	% HH aware of PA	% HH sold to PA	Of Col 4 % HH getting MSP
1	2	3	4	5
Kharif				
Paddy	32.2	25.1	13.5	27
Jowar	8.3	6.3	1.7	1
Maize	10.6	7.6	4.2	8
Groundnut	6.4	4.5	1.1	2
Soybean	7.9	5.7	3.6	6
Cotton	20.4	15.4	6.9	12
Rabi				
Paddy	31.5	18.7	10	14
Maize	11.8	6.1	2.9	4
Wheat	39.2	34.5	16.2	35
Gram	12.6	9.7	3.9	5
Potato	12.1	9	0.6	2
Rapeseed and mustard	15.5	12.8	2.9	14

households, and farmers may not realize the MSP even if they sell at the mandi (Negi et al. 2018). The actual price they receive depends on several factors, including the bargaining power they enjoy because of their socio-economic standing; the monopsony power the mandi enjoys (Chatterjee & Kapur 2016); and the complex interactions of the farmers in the factor, credit and output markets (Negi et al. 2018).

Why does a very small proportion of households sell to procurement agencies? Even paddy and wheat growers, whose awareness of MSP is higher, do not sell much to procurement agencies, because procurement agencies are not available; open market prices are higher; crop quality is poor; and farmers pledge their crop before the harvest. However, irrespective of the realization of the MSP, most farmers (94%) would prefer the system to continue, according to an evaluation report of NITI Aayog – although 79% of the sample farmers are dissatisfied with the MSP declared by the government – because they feel that the MSP lends psychological support (GoI 2016a).

4 Access to market and its impact on income

Table 7 provides the values of the indices of market access: market orientation, market agency choice, market information and overall index FAMI. The dimensions of market access are positively and significantly correlated among themselves; therefore, these can be combined into a single composite index. The value of FAMI for kharif and rabi seasons across states is not perfectly correlated, indicating that farmers have differential market access in these seasons. However, compared to other crops, paddy in the kharif season and wheat in the rabi season have an advantage

Table 7. Dimension indices and FAMI for major states

State	Kharif						Rabi					
	MO	MC	MI	FAMI	Rank	Net crop income/ HH/ annum (Rs)	MO	MC	MI	FAMI	Rank	Net crop income/ HH/ annum (Rs)
Andhra Pradesh	0.305	0.336	0.201	0.274	13	20784	0.463	0.194	0.114	0.218	16	27756
Bihar	0.218	0.592	0.176	0.283	12	18120	0.237	0.346	0.115	0.211	18	23040
Chhattisgarh	0.582	0.874	0.794	0.739	2	70308	0.392	0.579	0.689	0.539	4	10032
Gujarat	0.319	0.442	0.092	0.235	15	48732	0.341	0.624	0.234	0.368	11	21660
Haryana	0.462	0.836	0.667	0.636	3	96768	0.538	0.900	0.727	0.706	2	92028
Himachal Pradesh	0.300	0.611	0.326	0.391	8	59892	0.099	0.365	0.363	0.236	14	9132
Jammu & Kashmir	0.032	0.333	0.099	0.102	19	60204	0.246	0.279	0.159	0.222	15	13308
Jharkhand	0.224	0.658	0.074	0.222	16	22608	0.236	0.41	0.099	0.212	17	12228
Karnataka	0.313	0.544	0.01	0.121	18	81216	0.454	0.45	0.014	0.142	19	37116
Kerala	0.316	0.487	0.787	0.495	5	51204	0.319	0.464	0.589	0.444	7	33552
Madhya Pradesh	0.360	0.588	0.607	0.504	4	47580	0.367	0.731	0.558	0.531	5	48768
Maharashtra	0.330	0.441	0.207	0.311	11	71484	0.299	0.534	0.164	0.297	12	21072
Odisha	0.227	0.314	0.499	0.329	10	25932	0.268	0.303	0.636	0.372	9	7848
Punjab	0.780	0.956	0.862	0.863	1	151596	0.708	0.888	0.931	0.837	1	109092
Rajasthan	0.186	0.661	0.139	0.257	14	34872	0.337	0.674	0.225	0.371	10	40440
Tamil Nadu	0.288	0.447	0.328	0.348	9	20160	0.403	0.337	0.401	0.379	8	25848
Telangana	0.417	0.572	0.500	0.492	6	67788	0.479	0.504	0.51	0.497	6	33672
Uttar Pradesh	0.447	0.563	0.377	0.456	7	31716	0.466	0.619	0.901	0.638	3	36804
West Bengal	0.155	0.366	0.138	0.199	17	10896	0.285	0.24	0.25	0.257	13	12600
All India	0.298	0.552	0.399	0.403		43008	0.249	0.508	0.427	0.378		30924
CV (%)	49.8	32.7	75.4	53.2		65.4	37.2	41.4	70.3	48.4		82.9

Note: CV, coefficient of variation, is the ratio of standard deviation to mean, expressed as percentage.

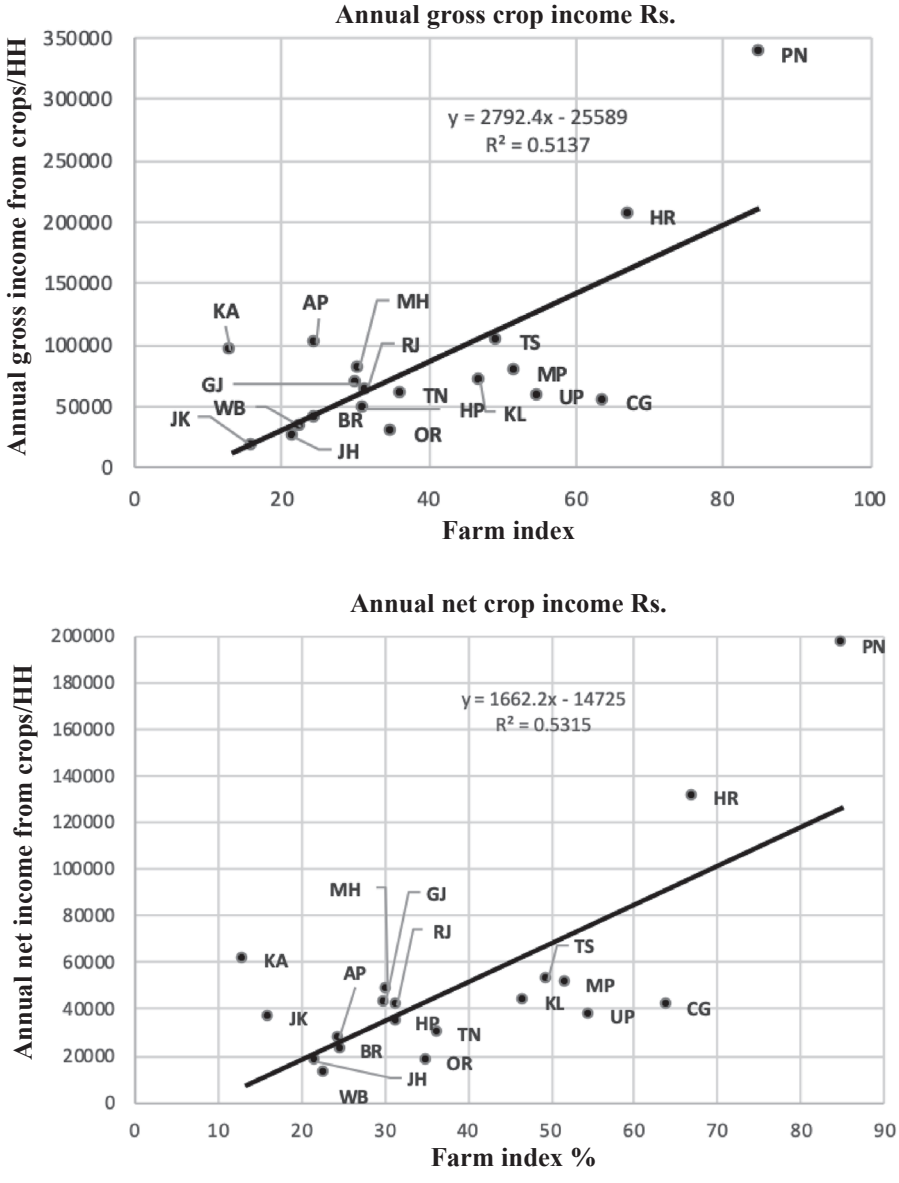

Figure 2. Relation between FAMI and crop income

in terms of having an elaborate market support or procurement system in many states.

States like Andhra Pradesh and Karnataka rank poorly on the FAMI or its individual dimensions, which is a puzzle, as these are known to be better at marketing arrangements and procurement networks. A probe into individual indicators by crop and marketing agency shows that while state-level marketing arrangements may be robust, farmers sell most of their produce to local traders. We plot annual income (simple average of kharif and rabi) against FAMI (Figure 2), which shows a positive and significant relation between FAMI and income, gross as well as net.

To know the impact of market access, we estimate a regression equation wherein income (net and gross) is regressed on the FAMI along with some controls (Table 8). The value of R^2 is quite high, and the FAMI has the expected sign and is significant. A one percent increase in market access increases net income and gross income by 0.359% and 0.316%, respectively. In absolute terms, at mean values, it translates into an improvement of Rs 392 in net income and Rs 764 in gross income with every increase of one percentage point in index.

Our results show that socially disadvantaged groups have lower incomes, due perhaps to limited access to credit and other resources (Satyasai et al. 2017). The

Table 8. Relation between income from crop cultivation and dimensions of market access

Variable	Description	Model I			Model II		
		Log of net income			Log of gross income		
		Coefficient	*t*-ratio	Level of significance	Coefficient	*t*-ratio	Level of significance
Constant		11.305	13.45	***	3.858	4.775	***
Season	Dummy: Kharif =0 and Rabi=1	-0.559	“3.428	***	-0.084	-1.068	
Ln Farm size	Ln of farm size, Ha,	0.615	4.101	***	0.276	3.106	***
Ln FAMI	Ln of market access index	0.359	2.144	**	0.316	3.924	***
Ln SC/ST HH	Ln % SC/ST in total HH	-0.538	“3.647	***	-0.105	-1.345	
l_Cost	Ln cost of cultivation (Rs)				0.650	10.740	***
Mean of dependent variance			10.392			11.158	
R-squared		0.60			0.92		
F(4, 33)		12.173		*F*(5, 32)	75.936		
SE of regression		0.502			0.238		

Note: ***, **, *Significant at 1%, 5% and 10% level, respectively.

present model corroborates this, as the net income from crops is significantly less in the states where the proportion of SCs/STs among agricultural households is higher. In the model with gross income as the explained variable, cultivation cost is introduced additionally. Cost has a positive and significant association with gross income, as expected, with an elasticity of 0.65; if the cost of cultivation rises by 10%, the gross income grows by 6.5%.

5 Conclusions

Access to market is important for farmers to realize better returns. Ever since the Agricultural Price Policy was initiated, MSPs are declared before the commencement of crop season. Farmers have regularly been demanding higher MSP and expressed dissatisfaction with MSP system some way or the other. Even recent declaration of MSP of 150% of cost A1 + family labour cost met with criticism. It is often said that mere declaring MSP is not enough to ensure better returns to farmers. Marketing channels available to farmers, market support system that can ensure realization of MSP, market forces of supply and demand at the time of harvest – both locally and globally, efficiency of markets, market information, bargaining power of farmers, transport costs, etc. -– are important factors that count. In this context, this paper explored the farmer’s access to markets in terms of the extent of selling crop produce in the market, awareness about MSPs and probability of realizing MSP, reasons for selling to local traders that may not ensure better prices, and so on.

Farmers, especially smallholders, depend heavily on local traders for selling their produce though, a priori, selling to procurement agencies and traders in mandi is likely to fetch better prices. About 50% of the quantity sold is through local traders on an average for all crops. For certain crops, the share of quantity sold by smallholders to local traders is up to 98%. Several considerations such as convenience and ease in selling within the village, saving on transport and hassles in selling in mandi, which may not be always efficient, seems to outweigh in the choice of market channel. Surprisingly, large proportion of households are satisfied with the agency they dealt with, though the level of satisfaction among those selling in mandi is significantly higher compared to those who sold to local traders. Awareness about MSP is very low which reflects in lower proportion of households who sold through public procurement system and realized MSP.

The study proposed a composite index, FAMI combining nine indicators under three dimensions: market orientation, MC and market information. It is evident that states with higher FAMI also showed higher net and gross incomes from crop cultivation.

Other things being equal, 10% increase in FAMI can lead to an increase of 3.6% increase in net income and 3.2% increase in gross income. That works out to an increase of Rs 392 in net income and Rs 764 in gross income, at the margin. Thus, the findings indicate that even as MSP is declared uniformly for all states, farmers who have better access to markets, in its multiple dimensions, are likely to obtain higher incomes.

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