



Management Approaches and Strategies by the Farmers to Cope Up with the Risk of Covid-19 Pandemic

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ABSTRACT

This study was conducted under the department of Agricultural Economics, Uttar Banga Krishi Viswavidyalaya, Coochbehar, West Bengal, India during October, 2021 to January, 2022. The objective was aimed to evaluate the management approaches in relation to management principles for sustaining their farming during Covid-19 pandemic with a unique set of primary data (before, during and after of pandemic) collected in Jalpaiguri district, West Bengal, India. Tabular, multiple regression and Garrett ranking analysis were followed to obtain the results for interpretation. Impact of the management approaches was reflected in positive net income (return-cost ratio around 1.09) in spite of variation in yield and price for two crops viz. paddy and wheat. Mobile phone was largely used for transaction. Multiple regression analysis predicted some independent variables responsible for low yield. The study, thus, showed the farmers' managerial strategies during pandemic helped them to maintain livelihoods. Restriction in consumption, saving, entertainment, investment and other expenditures had been evident. Low risk enterprises like livestock and vegetables were followed to reduce risk. Like a visionary manager, majority of the farmers (76%) prioritised (Garrett ranking) on more Govt. initiatives. Extent and variation of management principles (functions) viz. planning, organizing, leading and controlling, as followed by the farmers was also examined and found to be relevant. The study, thus, showed the managerial strategies and efficiency of farmer-manager during pandemic which helped the farmers' to sustain livelihoods during pandemic.

KEYWORDS: Agriculture, Covid-19, farm efficiency, farmer-manager, regression, strategy

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1. INTRODUCTION

Indian economy has witnessed an economic recession due to occurrence of Covid-19 pandemic. It impacted in three major areas viz. climate, price (market) and health. Agriculture is the main stay of economy and how it was affected is assumed to be most important aspect. However, the tangible affects were recorded in case of declining GDP rate, low per capita income, inadequate employment opportunity, threat in health sector and human well beings, etc. To cope up such risky and uncertain situations, application of principles of management in farming is assumed to be much important. India has 100 to 150 million farmers and agriculture employs nearly 263 million workers (Menon and Schimdt-Vogt, 2022). Activities performed by Indian farmers include land-ownership, planner, manager, financier, labour, marketer, processor, etc. During pandemic, farmer empowerment in carrying out farming activities as the main livelihood has been declined (Damanik et al., 2021). Due to application of managerial aptitudes in combination with favourable climate, agricultural GDP showed positive growth rate (3.5%) during pandemic. Dev and Sengupta (2020) urged government to put forward a set of policy recommendations for specific sectors. However, farmers' managerial ability, behaviours, planning, strategies, innovativeness, etc. are changing with the changes in respect of inputs, services, credit, marketing, environment, etc. and that would be in conformity with the focus of obtaining minimum financial advantages from their agri-business. Farmers' attitudes may be classified as: risk-averse those who try to avoid taking risks; risk-takers those who are open to more risky business options; and risk neutral farmers who lie between the risk-averse and risk-taking position (Kahan, 2008, Colena and Moore, 2020). However, attitude of risk-taker is considered to be more effective. Study of Reddy and Mariyappan (2021) confirmed that the farmers have endeavored to market their produce in village markets and semi-rural towns with their own marketing strategies during Covid-19 lockdown. In addition, Indian farmers have the abilities to survive in the event of seasonal variations, climate change, variety of soil, wildfires, droughts and floods. Effectiveness of the contribution of the ability was also confirmed by Dagar et al. (2020) who noted that during Covid-19, farmers increased their technical efficiency through the best use of family labour. Other authors have also studied the managerial pattern as followed by the farmers in various ways. Study of Ebel et al. (2020) also stressed on crop diversification as a tool to tackle pandemic. In addition, Totapally et al. (2020) found that about 84% of people in vulnerable areas reduced the number of meals consumed in daily need basis and received food rations through public distribution system (PDS) as a part of

strategic management. Muneer et al. (2023) identified that labour availability was increased due to reverse migration. COVID-19 has pushed people to move their skillset into the virtual space, and the people can take advantage of that if the concerned are open to it (Anonymous, 2020). Thus, the research question is that how the managerial practices of farmers save their agricultural production and livelihood during pandemic.

Against these backdrops, the present study was conceived a Northern district of West Bengal during 2021–22 with primary data to analyse and compare the variations in farm operations and economics for the three stages viz. before, during and after Covid-19 pandemic and to study the farm management and other management practices adopted by the farmers during pandemic to reduce risk.

2. MATERIALS AND METHODS

A personal interview of 80 farmers from the Jalpaiguri district of West Bengal, India was conducted during October, 2021 to January, 2022 with the help of structured schedule. For convenient of analysis with available primary data, the farmers were categorized into two groups based on their operation landholdings. Two groups are (i) small farmers having operational landholding upto 2 ha and (ii) medium farmers with operational landholding 2–4 ha. Here, small and marginal farmers are clubbed into one group of farmers i.e. small farmers for their similarity in behaviour and agricultural practices. Based on the level of frequency, marginal and small (upto 2.0 ha) which was termed as small in the study and semi-medium (2–4 ha) which was used as medium categories of farmers were selected purposively as the sample respondents. Secondary information was also consulted to substantiate and verify the primary data.

2.1. Analytical procedure and concepts used

2.1.1. Cost concepts

To measure the efficiency of farm business, farm management cost concepts of CACP (Commission for agricultural costs and prices) were applied (Dhondayal, 2008). There are eight concepts of costs. However, for convenience of the study, only Cost A_1 and Cost C_3 had been followed as first one represents the operational (paid out) cost and other is total cost (operational+fixed). Farmers are more concerned about the Cost A_1 . On the other hand, concept of Cost C_3 is applied for policy making (price) purpose like MSP (Minimum Support Price).

2.1.2. Multiple linear regression analysis

The technique of Multiple Linear Regression Analysis is applied for tracing out the variables influencing the production or yield of crop. The estimates of the analysis will show the extent of influence of each input (variable) on



the level of product. This analysis was carried out by using the following equation-

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 \dots\dots\dots(1)$$

Where, Y=Yield (Production), a=Constant, bi=Regression coefficients, X₁=Area, X₂=Fertilizer application, X₃=Price of crops, X₄=Total householding, X₅=MSP (Minimum Support Price), X₆=Application of manure, X₇=Savings, X₈=Investment in Agriculture

1.1.3. Constraints analysis - Garrett ranking method

Garrett method is often used to complete the ranking of an alternative based on the ratings of respondents that are converted into certain ranks. This ranking is done by determining the most significant factor from the respondent's answer. The ranking of alternatives by using Garrett method is done by calculating the respondent's

data as a factor of the percentage position value using the following equation -:

$$\text{Percent position} = 100 (R_{ij} - 0.5) / N_j \dots\dots\dots(2)$$

Where,

R_{ij}= Rank given for the ith variable jth respondents

N_j is the number of variables ranked by jth respondents

3. RESULTS AND DISCUSSION

2.1. Variations in farm operations and economics for the three stages viz. before, during and after Covid-19 pandemic

3.1.1. Cost of cultivation

Cost of cultivation (₹ ha⁻¹) of paddy and wheat were done and are presented in the Table 1. Cost of cultivation (Cost A₁ and Cost C₃) is found to be more during pandemic for both crops (paddy and wheat) in small farmers' plots.

Table 1: Cost of production of Paddy and Wheat for small farmers (₹ ha⁻¹)

Crops	Cost Concepts	Cost of cultivation			Change of cost of cultivation during pandemic (%)	
		Before	During	After	Before	After
Paddy	Cost A ₁	33181.75	37437.75	35800.75	12.82	4.57
	Cost C ₃	60466.17	68351.52	64570.82	13.00	5.85
Wheat	Cost A ₁	38710.75	44520.00	42381.50	15.00	5.04
	Cost C ₃	66671.82	76363.00	71919.65	14.53	6.17

1US\$=INR 80I (average during the harvesting month)

Before pandemic, ranges of change between the values of Cost A₁ and Cost C₃ are more (12 to 15%) compared to the situation after pandemic (4 to 6%). This implies that farmers could not manage to get the normal return immediately after pandemic when compared with the return of before pandemic. Harris et al. (2020) found that during the period of lockdown, labour shortages (about 32%) and the high cost of labour (53%) were the important contributors to yield loss and increasing harvest cost.

Cost of cultivation of the same crops for medium farmers showed the same trend like the small farmers. Only difference is that the amount invested by medium farmers in cultivation were more compared to small farms. Details

of the estimates are given in the Table 2.

3.1.2. Farm business analysis (profitability)

Profitability analysis shows the extent of profit the farmers earned on investment in crop production during the periods under study. For small farmers, estimates on the basis of Cost A₁ and Cost C₃ showed that profits were drastically reduced during pandemic. When compared with the performances before pandemic, the range was lower for Cost A₁ (4 to 18%) compared to Cost C₃ (61 to 65%). Values of the same item for "after pandemic" stood at 7 to 28% and 63 to 72% respectively (Table 3). However, the farmers could manage to get minimum profit during pandemic which was

Table 2: Cost of production of Paddy and Wheat for medium farmers (₹ ha⁻¹)

Crops	Cost concepts	Cost of Cultivation			Change of cost of cultivation during pandemic (%)	
		Before	During	After	Before	After
Paddy	Cost A ₁	36338.53	40855.75	38976.50	12.43	4.82
	Cost C ₃	63787.38	72991.32	68091.65	14.42	7.19
Wheat	Cost A ₁	41441.55	47350.00	43524.50	14.25	8.78
	Cost C ₃	70775.10	79915.00	74166.95	12.91	7.75

Table 3: Farm business (profitability) analysis of paddy and wheat for small farmer (₹ ha⁻¹)

Crops	Analytical technique	Profitability measures			Change of cost of cultivation during pandemic (%)	
		Before	During	After	Before	After
Paddy	FBI (GR-Cost A ₁)	45593.25 (R:C=2.37)	37292.25 (R:C=1.99)	51849.25 (R:C=2.45)	-18.20 (16.03)	-28.07 (18.77)
	FNI (GR-Cost C ₃)	18308.82 (R:C=1.30)	6378.47 (R:C=1.09)	23079.17 (R:C=1.3)	-65.16 (16.15)	-72.36 (16.15)
Wheat	FBI (GR-Cost A ₁)	37110 (R:C=1.95)	35380 (R:C=1.79)	39218.5 (R:C=1.9)	-4.66 (8.20)	-7.78 (5.78)
	FNI (GR-Cost C ₃)	9148.17 (R:C=1.13)	3538 (R:C=1.04)	9680.35 (R:C=1.14)	-61.32 (7.96)	-63.45 (8.77)

Note: FBI: Farm business income, FNI: Farm net income, GR: Gross return, R:C: Return-cost ratio

ascertained from the values of return-cost ratio (R:C more than 1.00). Profit from paddy was little bit higher than wheat. It could be attributed to the managerial capability of the experienced cultivator-farmers in the area. However, Varshney et al. (2021) found that rural households, including smallholders, were affected by loss in migrant income, livelihood and farm and non-farm incomes

In case of medium farmers (Table 4), almost same trend

was observed while estimating the profit. In absolute term, volume of profit was higher compared to small farms. Low level of profit while considering Cost C₃ (total cost) had very little significance to them as they remained satisfied if gross return covered Cost A₁ (operational cost). Since variation in profit was less, it can be assumed that wheat was less vulnerable to pandemic compared to paddy and farmers had followed higher investment and managerial practices for success of wheat crops.

Table 4: Farm business (profitability) analysis of paddy and wheat for medium farmer (₹ ha⁻¹)

Crops	Analytical technique	Profitability measures			Change of cost of cultivation during pandemic (%)	
		Before	During	After	Before	After
Paddy	FBI (GR - CostA ₁)	53561.47 (R:C=2.47)	38432.5 (R:C=1.94)	59448.5 (R:C=2.52)	-28.24 (21.45)	-35.35 (23.01)
	FNI (GR-Cost C ₃)	26112.61 (R:C=1.40)	6296.92 (R:C=1.08)	30333.35 (R:C=1.44)	-75.88 (22.85)	-79.24 (25.00)
Wheat	FBI (GR - CostA ₁)	35368.45 (R:C=2.33)	36950 (R:C=1.78)	38075.5 (R:C=1.87)	4.47 (23.60)	-2.95 (4.81)
	FNI (GR-Cost C ₃)	6037.9 (R:C=1.08)	4385 (R:C=1.05)	7433.05 (R:C=1.08)	-27.37 (2.77)	-41.00 (2.77)

Note: FBI: Farm business income; FNI: Farm net income; GR: Gross return; R:C: Return-cost ratio

3.1.3. Variations in yield

Yields of paddy and wheat for the periods of “before”, “during” and “after” pandemic were noted for small and medium farmers. Table 5 showed that variation (reduction) of yield of paddy both for small and medium farmers were more compared to wheat. Maximum variation was observed in case of paddy for small farmers which recorded at (-)13.78% (before) and (-)20.38% (after) respectively. Results of the field experiment at farmers’ level conducted by Ceballos et al. (2020) in the State of Haryana showed that sowing time, inputs use and harvesting time yield of

wheat crop were unaffected during lockdown period to check Covid-19. Minimum variation of yield compared to normal yield was recorded.

3.1.4. Variations in the level of input applications

The findings on the level of input application during pandemic were quite general in nature. Both small and medium farmers followed same practices and strategies. Costs incurred for hired labour, participation of family member and inputs were at higher side during pandemic which is indicated with “+ve” sign in Table 6. As a consequence, net return was reduced which is marked with “-ve” sign.

Table 5: Deviation of crop yield during pandemic (Unit: (kg ha⁻¹))

Farmers' category	Yield of Paddy			Yield of Wheat			Change of yield during pandemic (%) for Paddy		Change of yield during pandemic (%) for Wheat	
	Before	During	After	Before	During	After	Before	After	Before	After
Small	3555	3065	385	333	3600	3600	-13.78	-20.38	9.00	0.00
Medium	4050	4065	4250	3800	3800	4050	0.37	-4.55	0.00	-3.75

Table 6: Variations level of input application, yield and profit according to farm size during pandemic

Category of farmers	Particular	Direction of variation during pandemic
Small and Medium Farmer	•Hired labour cost	+ ve
	•Participation of family labour	+ ve
	•Input costs (seed, PPC, fertilizer, manure, machinery)	+ ve
	•Yield	- ve
	•Price of produce	- ve
	•Gross Income	- ve
	•Net Income	- ve

Note: "+"=increased, "-"=decreased

3.1.5. Study of variables affecting yield

A modest attempt was made to predict the independent variables influencing the yield (dependent variable) of crop during the pandemic for both small and medium farms by using multiple regression model.

The Table 7 demonstrates different regression coefficients along with their *p*-value for both small and medium farmer during pandemic. The results suggested that the variables, area and MSP are significant at 5% level of significance for determining the yield of paddy for small farmers. On the other hand, minimum support price and manure are significance at 5% and 10% level of significance respectively for determination of yield for medium farmers. The values of R² and adjusted-R² of the model (formula $y=b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+\epsilon$) are 0.771 and 0.689 (small farmers) and 0.623 and 0.568 (medium farmers). The simple were homogeneous in nature and, thus, existence of multicollinearity may act in the model since it captured very few variables to significantly determine the dependent variables (yield).

In case of wheat, the estimates had remained in conformity with the results of paddy. This implies that the cultivators had followed similar package of practices for which influence of the inputs (independent variables) on yield (dependent variable) had expressed a similar trend.

Table 7: Consolidated results of significant estimates determinants of yield of paddy in the period of "during pandemic" for small and medium farmers

Category of farmers	Variables	Units	Coefficient	<i>p</i> -value
Small farmers	Intercept		6.695	0.026
	Area	ha	0.911	0.043*
	MSP	₹ kg ⁻¹	0.00580	0.00030*
	R ²		0.771	
	Adjusted R ²		0.689	
Medium Farmers	Intercept		6.182	0.06
	MSP	₹ kg ⁻¹	0.00310	0.00034*
	Manure	kg ha ⁻¹	0.443	0.08**
	R ²		0.623	
	Adjusted R ²		0.568	

p*=0.05; *p*=0.1 significance Level

3.1. Farm management and other management practices adopted by the farmers

3.1.1. Management strategies/practices adopted by farmers

Farmers were acting as home manager and farm manager. Their actions always aimed towards overall welfare by reducing the risk. As such, following Table 8 has registered the number of respondents who had adopted different management strategies (practices) to tackle the Covid-19 pandemic situation at their homes and farms.

The major items of management practices were involvement of more family labour in farming (70%), seeking of alternative job (65%), use of online media (66.25%), low level use of locally produced inputs (88.75%), selling of produce through middlemen (58.75%), insurance (55%), routine in food consumption 87.5%), holding more liquid money (70%), crop diversification, etc. Principato et al. (2022) pointed out that incorrect food management had left the people in miserable condition during pandemic. The significant change in attitude of the farmers lead them widely to use online mode of communications (Interactive chat, SMS, Facebook, WhatsApp, etc.) for various purposes.

Table 8: Management practices adopted by farmers (small and medium) during pandemic (N=80)

Sl. No.	Strategies	No. of farmers followed	Percentage
1.	Seeking alternative Job	52	65.00
2.	New scope of job	25	31.25
3.	High yield short duration crop	20	25.00
4.	Involvement of Family labour	56	70.00
5.	Crop production management	40	50.00
6.	Borrowed fund	33	41.25
7.	Holding liquid money	56	70.00
8.	Insurance	44	55.00
9.	Less Savings	38	47.50
10.	Marketing through middlemen	47	58.75
11.	Use of online media	40	50.00
12.	Routine in food consumption	70	87.50
13.	Birth control	75	93.75
14.	Low level of inputs (local)	71	88.75
15.	Crop diversification	70	87.50

Study also showed that about 37% of small farmers used digital tools for communication during Covid-19 pandemic like WhatsApp, TV, SMS, Interactive voice, Facebook, etc. (Anonymous, 2021).

3.1.2. Constraints analysis based on farmers' perceptions

Farmers' perceptions were studied to ascertain their views and feelings about different constraints during Covid-19 pandemic which may stand in the way of business performance of farming. Garrett ranking technique was followed for this purpose. Only ten important constraints were considered as per farmers' perceptions which are presented in Table 9.

The supply (availability) of necessary goods occupied the first position according to farmers' perceptions. It was followed by Govt. initiatives during emergency period (pandemic) and promotion of FPO and SHGs. Besides, they perceived that direct benefit transfer, free supply of agricultural inputs and ration and provision of more credit could help them during the period of pandemic. On the other hand, medium farmers assigned maximum weightage on free supply of agricultural inputs and ration (PDS). Besides, possession of liquid money, delivery of more farm credit, arrangement

of alternative jobs, road repair for marketing, etc. had much role for social and economic benefits of the medium farmers.

Table 9: Score and position of different constraints for of small farmers on yield performance

Sl. No.	Constraints	Small Farmers		Medium Farmers	
		Score	Rank	Score	Rank
1.	Liquid money	85.6	5	89.00	2
2.	More DBT scheme	86.00	4	86.20	5
3.	Govt. arrangement in emergency	86.60	2	-	-
4.	Supply of Necessary goods	89.00	1	--	-
5.	More Credit	85.35	8	86.70	3
6.	Free inputs and ration supply	84.20	10	89.20	1
7.	Alternative jobs	85.40	7	86.60	4
8.	Physician near home	85.50	6	85.80	7
9.	High interest for saving	85.20	9	89.00	2
10.	Promotion of FPO or SHG	86.00	3	85.80	6
11.	New Technology	-	-	83.00	10
12.	Road repair	-	-	84.2	9

During the Covid-19 pandemic (2020), deployment of family members and local labours in agricultural operations, increased exchange for various inputs, evolving informal groups for supply of inputs and reduced use of input in agriculture emerged as major autonomous coping strategies in various States (Haryana, Punjab, Uttar Pradesh, Gujarat and West Bengal) (Anonymous, 2021). *Management principles and management practices by the farmers*

The study had also attempted to correlate different activities and strategies/practices adopted by the farmers in relation with four management functions viz. planning, organizing, leading and controlling during pandemic with the management principles. Table 10 depicts that farm and home management practices of many farmers could be matched or correlated with the management principles. However, not all of them had followed all principles as such. Planning part deserved much more attention from them for which they had to access more information and expertizes. In case of other principles, farmers' strategies in support of them were very prominent. Thus, farmers' management attitudes and behaviours helped them to sustain in pandemic situation with their farm businesses.



In this connection, Wulandari et al. (2021) suggested intervention and interaction of farmers' innovation could be done farmers' cluster-wise for efficient management of farmers' innovation during pandemic. Digital Green (2020) also suggested to support ram up the digital responses in this regard.

Table 10: Tracing out of farmers' practices in relation with management principles during Covid-19 pandemic

Sl.No.	Management principle	Farmers' practices	Farmers followed (%)
1.	Planning	Focus to continue agriculture and saving family •Low cost of cultivation •Minimum consumption cost • Profit with remunerative price •Alternative livelihood	25.5% all 51.5% medium 20% low 3% traditional
2.	Organizing	Focus on more involvement of family members •Employ labour available from reverse migration •Reduce hired labour •Involve more family labour •Rearing more livestock •Market through middlemen and niche market •Identify excess family member for special job	86% all 14% selective
3.	Leading	Focus on more communication between farmers •Contact with FPO and Big farmers •Insists Govt. arrangements •Priory on short duration and high yielding varieties •Pressure for free supply of input •Emphasize communication with WhatsApp, Facebook, SMS, Transactional Apps, etc.	60% all 30% medium 10% selective
4.	Controlling	Focus on effective application of strategies •Consult electronic media •Update about business •Delivery boy as alternative job for unemployed •Selling by self in small pocket •Contact by electronic media • Ignore high investment and high cost	50% all 25% selective 25% occasional

3. CONCLUSION

The combat mechanisms like the adoption of livestock, use of electronic media, employing more family labour, reduction in consumption cost, use of locally available low-cost inputs and use of niche market had led to ensure net income for the selected crops during Covid-19 pandemic. Besides, the farmers also expressed their views to have some important govt. supports in respect of free inputs and ration supply, liquid money, new technology, repair of road, more interest rate in saving bank account and alternative livelihood opportunities.

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