FACTORS DETERMINING MARKETING OF PADDY DURING COVID-19 REGIME IN ANDHRA PRADESH

Original Research Article

Abstract: Rice is the major food crop in India. In Andhra Pradesh during COVID-19, marketing of rice was affected by many factors like lack of accessibility to market, scarcity of labour and high transportation cost which led to farmgate sales and resulted in the reduction of farmers income. Multistage sampling was used for the study. In the context of India, the state of Andhra Pradesh was selected for the study as it is one of the top grower of rice, from this state, the West Godavari district was chosen as it is the top grower of rice, followed by the selection of three mandals within the district. Further, two villages were picked from each mandal, with the criteria based on paddy cultivation area. Around 120 farmers from these selected villages were then chosen to gather essential information. Ordinal logistic regression was used to evaluate the factors determining marketing of paddy during COVID-19 using STATA software. The study revealed that non-availability of storage facility, labour scarcity and availability of transportation facility were the major factors which influenced the marketing of paddy during COVID-19 regime. Marketing of produce can be done through formation of effective Farmer Producer Organizations (FPO) by Strengthening the market linkages.

Key words: Andhra Pradesh, COVID-19, Paddy Marketing, Ordinal Logistic Regression.

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Introduction

In Andhra Pradesh, West Godavari district ranked first in rice in area of 1.7 million hectares, with a production of 2.65 million tonnes production and with 6723 kg ha^{-1} productivity (Agricultural Statistics at a glance, 2019-2020). Marketing of rice was majorly affected by the lockdown imposed during COVID-19 since the harvesting period coincided with the restrictions on the movement of people and machinery. The constraints *Viz.*, lack of accessibility to market, scarcity of labour due to social distancing measures, high transportation costs due to restrictions on transport and non-availability of the market information were also experienced by the rice farmers. Heavy losses of life due to the disease prolonged lockdowns, shutdowns, and other protection measures necessitated by the COVID-19 pandemic gave an additional blow, where the society has witnessed a severe disruption to the upstream (input supply and production), midstream (processing, marketing, and logistics), and downstream (retail and consumption) segments of the paddy value chain (IRRI, 2020). Significant decline in the availability of pesticides, fertilizers, and seeds was reported due to restrictions on the movement of vehicles, closure of shops and markets. Keeping in view of the above facts present study was designed to analyse the factors determining marketing of paddy during COVID-19 Regime in West Godavari district of Andhra Pradesh.

MATERIALS AND METHODS

Sampling Design

Multistage sampling design was adopted for selection of sample at different levels of district, mandal and village for the present study. In Andhra Pradesh, West Godavari district was selected as it possessed the highest area and production under rice with 1.7 million hectares and 2.65 million tonnes respectively (Agricultural Statistics at a glance 2019-2020). Three mandals were selected i.e., Tadepalligudem, Ungutur and Pentapadu based on the highest area under paddy with 21.68 thousand hectares, 19.91 thousand hectares and 18.58 thousand hectares respectively. Here we selected 120 samples as per the below formula, for that we selected two villages were selected from each mandal based on highest area thus making a total of 6 villages. From Ungutur mandal, Ungutur and Chebrol, from Pentapadu mandal, Darsiparru and Jatlapalem and from Tadepalligudem mandal Jagannadhapuram and Madhavaram villages were selected. Twenty farmers from each village were randomly selected since the effect of COVID-19 on everyone during the study period, thus comprising a total of 120 sample farmers.

Sample Size selection for Ordinal Logistic Regression;

$$N = \frac{2.k.(k-1)}{\Delta^2} \cdot \frac{p.(1-p)}{1+(k-1).p} \cdot \frac{z^2_{\propto/2}}{Power}$$

- N: Required sample size.
- k: Number of response categories.
- p: Estimated proportion in the most common category.
- Δ: Smallest meaningful difference between two proportions.
- $z^2_{\propto/2}$: Z-score corresponding to the desired significance level α.
- Power: Desired statistical power.

$$N = \frac{2.3.(3-1)}{0.5^2} \cdot \frac{0.5.(1-0.5)}{1+(3-1).0.5} \cdot \frac{1.96^2}{0.80} \approx 115.33$$

Methods of Data Collection

The necessary data for selection of district, mandals and villages were collected from secondary source. The primary data was collected from the sample farmers through a pre-tested and well-designed questionnaire developed for the study. The secondary data pertaining to the area, production and productivity of the rice cultivation in the selected district for the year 2019-20 were collected from the Agriculture Statistics at glance 2019-2020.

Methods of Data Analysis

An ordinal logistic regression model was employed to analyse the determinants of paddy marketing during post COVID-19 regime. An ordinal logistic regression model determines the association among variables of interest. It is an extension of standard logistic

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regression. An ordinal regression model assumes that a dependent variable has categories which have a meaningful sequential order (Grilli and Rampichini, 2014). The response variable Y has three groups (1,2,3) then the ordered multiple response models assume the following relationship:

$$\text{Logit} = p[(Y \leq j\text{-}1/X)] = \alpha j + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots \beta pXp$$

Where, j= 1,2 and 3.

The ordinal logistic regression model is given as

$$P_1 = \frac{\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp)}{[1+\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp)]}$$

$$P_2 = \frac{\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp) + p1}{[1+\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp)]} \quad \text{and}$$

$$P3 = \frac{\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp) + p2}{[1+\exp(\alpha 1 + \beta 1X1 + \cdots\ldots + \beta pXp)]}$$

P1+P2+P3 =1

Where, P_1 is the probability of $P(Y_1)$,

P_2 is the probability of $P(Y_2)$ and

P_3 is the probability of $P(Y_3)$.

αj = is the threshold or cut points

X = Independent variables as described in table 1. for factors determining marketing of paddy during COVID-19 regime in Andhra Pradesh.

ε = is the error termSS

The maximum loss of income in the study area was observed 30% hence the dependent variable income was categorized into three groups (Y_1 = Income decreased by < 10 per cent considered Low, Y_2 = Income decreased by 10 to 20 per cent considered as Medium and Y_3 = income decreased by 20 to 30 per cent considered as High) based on the degree of decrease in the income when compared to the past three years average income of the sample farmers. The ordinal logistic regression model was performed by using STATA software.

Results and Discussions

The factors determining marketing of paddy during COVID-19 regime were analysed by using Ordinal Logistic Regression and the results were presented in Table 2. It was observed that the model was well fitted as the pseudo-R-Square value was found to be 0.3417, which indicated the denial of null hypothesis. That entire co-efficients in the model were equal to zero. Therefore, parallel with Hensher *et al.* (2005) criterion for best fit model (Values of pseudo R^2 between 0.2 and 0.4 are considered as to strongly fit), The overall fit of the ordinal logistic regression model (0.3417) was found to be extremely good. Also, from the outcomes, Chi-Square

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statistics showed that the parameters included in the model were significantly diverse from zero at 1% level.

Assessed coefficients after an ordered logistic regression were hard to infer as they are in log-odds units; as such, the marginal effects were considered. Marginal effects were interpreted relative to the category and sign. A positive coefficient for a category indicates an increase in that variable increases the probability of being in that category, whereas, a negative coefficient indicates a decrease in probability of being in that category.

It could be observed from the results that the variables non-availability of storage facility and Labour scarcity were significant at 1% level, other variables *viz.*, restrictions on the movement of produce, availability of transportation facility and access to market information were significant at 5% level. Marginal effects for each category were calculated. It could be observed from the marginal effects that except for the availability of transportation facility and access to market information all the other variables have negative and significant impact on income levels. The base category which was taken for interpretation was the low impact category.

Non-availability of storage facility

The results revealed that non-availability of storage facility was negatively significant at 1% level, the marginal effect of the non-availability of storage facility to the farmers during COVID-19 regime implies that, other things remain constant, a unit increase in non-availability of storage facility led to the probability of being in low income loss level decreased by 24.89 per cent, whereas, the probability of being in medium and high income loss level increased by about 9.36 per cent and 15.53 per cent respectively. The negative marginal effect was mainly due to the peak harvesting period of paddy that was coincided with the restriction on movement of vehicles as well as persons exerted a need to store the produce, majority of the farmers in the study area was small and marginal farmers, so due to lack of storage facility they have sold their produce lower than the Minimum Support Price (MSP) at their fields itself to the middlemen's/rice millers and that has reduced the farmers income.

Restrictions on movement of produce

The results revealed that restrictions on the movement of produce was negatively significant at 5% level, the marginal effect of the restrictions on movement of produce during COVID-19 regime implied that, other things remaining constant, a unit increase in restrictions on movement of produce led to the probability of being in low income loss level decreased by 82.89 per cent, whereas, the probability of being in medium and high income loss level increased by about 49.36 per cent and 33.53 per cent respectively. The negative effect of restrictions on movement of produce was

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mainly due to, imposition of complete lockdown by the government which included restrictions on the movement of harvested produce. With the fear of decreasing in anticipated prices and due to lack of proper storage facilities farmers had sold their produce at lower prices which led to decrease in income level of the farmers.

Labour scarcity

The results revealed that labour scarcity was negatively significant at 1% level, the marginal effect of the labour scarcity implied that, other things remaining constant, a unit increase in labour scarcity led to the probability of being in low-income loss level decreased by 37.36 per cent, whereas, the probability of being of medium and high-income loss level increased by about 16.01 per cent and 21.35 per cent respectively. labour scarcity especially during peak harvesting season and for loading and unloading the produce during transaction process adversely affected their income realization.

Availability of transportation facility

The results revealed that availability of transportation facility was positively significant at 5% level, the marginal effect of the availability of transportation facility implied that, other things remaining constant, a unit increase in availability of transportation facility led to the probability of being in low-income loss level increased by 17.64 per cent, whereas, the probability of being in medium and high-income loss level decreased by about 2.70 per cent and 14.94 per cent respectively. This is due to the fact that, the better transportation facility offers place utility so that the farmers can sell their produce at the distant markets which may offer high prices ultimately increases the farmers income.

Access to market information

The results revealed that access to market information was positively significant at 5% level, the marginal effect of the access to market information implied that, other things remaining constant, a unit increase in access to market information led to the probability of being in low-income loss level increased by 30.81 per cent, whereas, the probability of being in medium and high-income loss level decreased by about 15.65 per cent and 46.46 per cent respectively. This is due to the better access to market information enables the farmers to be aware of the prices and sell their produce at maximum price to get more income.

Similarly, the direct benefit cash transfer scheme (YSR Rythu Bharosa-PM Kisan Scheme) also helped the farmers significantly to procure quality inputs, higher yields and thereby income. It could be observed that better market linkages, access to market information, access to good storage and transportation facilities have exerted

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positive and significant influence on incomes of farmers during COVID-19 regime. These findings signify the importance of collective marketing of farm produce by the farmers, as they can transact large quantum of marketable surplus through realizing the economies of scale. Further, strengthening the market linkages of farmers should deserve prime attention and in this context formation of FPOs in the study area play a very crucial role.

Conclusion

Ordinal Logistic Regression was employed to study the factors determining marketing of paddy during COVID-19 regime in West Godavari district of Andhra Pradesh by using STATA software. The results of the study revealed that the variables such as non-availability of storage facility and labour scarcity were significant at 1%. Other variables *viz.*, restrictions on the movement of produce, availability of transportation facility and access to market information were significant at 5%. Marginal effects were calculated for each category, it could be observed that except for the availability of transportation facility and access to market information all the other significant variables had negative impact on income level *viz.*, Strengthening the market linkages, promoting online and e-NAM marketing, marketing of produce through formation of effective FPO's, constructing storage facilities at rural/mandal level, buying the harvest produce at farmer's fields, Increasing transportation facilities should be increased by constructing roads, providing transport vehicles to the distant villages by connecting the major cities, disseminating correct and reliable market information to the farmers may lead to effective marketing of rice during COVID-19.

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Table 1. Description of variables used in Ordinal Logistic Regression - factors determining marketing of paddy during COVID-19

S. No	Variable	Description
1.	Y = Income (Dependent variable)	Y_1 = Low Y_2 = Medium Y_3 = High
2.	X_1 = High transportation cost (Increase in transport cost)	1 = Yes 0 = No
3	X_2 = Access to market information (Whether farmers had access to market information or not)	1 = Yes 0 = No
4.	X_3 = Anticipating decline in price of output (Anticipating prices of output)	1 = Yes 0 = No
5.	X_4 = Non availability of storage facility (Weather storage facilities available or not)	1 = Yes 0 = No
6.	X_5 = Restrictions on movement of produce (weather there was restriction on movement of product or not)	1 = Yes 0 = No
7.	X_6 = Labour scarcity (Labour scarcity during COVID-19 regime)	1 = Yes 0 = No
8.	X_7 = Availability of transportation facility (Weather the transportation facility available or not	1 = Yes 0 = No
9.	X_8 = Cash transfer by Government or any N. G. O (Recovery resource) (Weather the cash transferred by government or not)	1 = Yes 0 = No

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10.	X_9 = Market linkages (Does the farmer have any marketing linkages or not)	1 = Yes 0 = No

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Table 2. Ordinal Logistic Regression co-efficients for evaluating factors determining marketing of paddy during COVID-19 regime

Number of observations = 120 **LR chi2(9) = 85.27** **Probability > chi2 = 0.0000** **Log likelihood = -82.13913 Pseudo R2 = 0.3417**							**Marginal effects**		
Income	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**		**Low**	**Medium**	**High**
Market linkages	-0.3531	0.8872	-0.4000	0.6910	-2.0920	1.3858	0.0478	-0.0166	-0.0312
High transportation cost	0.4658	0.5846	0.8000	0.4260	-0.6800	1.6115	-0.0714	0.0360	0.0353
Anticipating decline in prices of output	1.9559	1.2426	1.5700	0.1150	-0.4796	4.3913	-0.3532	0.2300	0.1232
Non -availability of storage facility	1.7418	0.4547	3.8300	0.0001**	0.8505	2.6330	-0.2489	0.0936	0.1553
Restrictions on movement of produce	5.0838	1.4227	3.5700	0.0201*	2.2953	7.8723	-0.8289	0.4936	0.3353
Labour scarcity	2.4575	0.4969	4.9500	0.0022**	1.4837	3.4313	-0.3736	0.1601	0.2135
Cash transfer by Government	-0.9219	0.8408	-1.1000	0.2730	-2.5699	0.7262	0.1190	-0.0310	-0.0880
Availability of transportation facility	-1.4355	0.4876	2.9400	0.0530*	0.4800	2.3911	-0.1764	0.0270	0.1494
Access to market information	-3.1757	1.3679	-2.3200	0.0230*	-5.8566	-0.4947	0.3081	0.1565	-0.4646
/cut1	3.2387	0.7871			1.6960	4.7813			
/cut2	7.1088	1.0537			5.0437	9.1740			

Note: ** - Significant at 1% level; * - Significant at 5% level

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