The Pharma Innovation Journal 2023; 12(4): 1355-1358

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 1355-1358

www.thepharmajournal.com
Received: 02-01-2023
Accepted: 04-02-2023

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e-Nam market participation intensity of chilli (Dry) farmers in Guntur district of Andhra Pradesh

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Abstract
e-NAM is envisaged as a pan-India electronic trading portal, which enables the farmers to realize best possible price. In this study, determinants of e-NAM market participation, e-NAM market participation intensity, problems faced by the farmers transacting chilli (dry) in Guntur district of Andhra Pradesh are investigated and relevant suggestions were provided. Simple random sampling was employed to draw sample of 60 farmers, out of which 30 farmers are transacting their produce through e-NAM and 30 farmers who do not transacting their produce through e-NAM. Probit regression model was used to identify the factors affecting the e-NAM market participation. The participation of farmers in e-NAM was significantly affected by experience, education, distance, source of price information, training received, transaction cost. Tobit regression model was used to find the factors affecting the e-NAM market participation intensity. The intensity at which the farmers participate in e-NAM was significantly influenced by price, source of price information, awareness on quality measures, training received, transaction cost. The main problem faced by the farmers participating in e-NAM is More involvement of middlemen. The findings generally suggest to develop a mobile app in the local language, strengthen e-NAM markets, linking all e-NAM markets with WDRA, mechanization of the activities.

Keywords: e-NAM, Garrett ranking technique, Probit regression and Tobit regression model

1. Introduction
Spices are aromatic vegetable products that are used in seasoning food. Among these, chilli is a significant spice that is consumed in many forms all over the world. The international market for chillies has long been dominated by Indian chillies. In addition to being the world's greatest producer of chillies, India is also its biggest user and exporter. 42% of the nation's total spice exports come from only the chilli. With 17.02 lakh tonnes produced, India is the world's top producer and accounts for 41% of all chilli production. Andhra Pradesh produced the most dried chillies in India in 2020–21, with 7.97 lakh tonnes grown on 1.77 lakh ha at a productivity of 4489 kg/ha. The price of chiles both domestically and internationally is influenced by Guntur Chilli Yard, the largest chilli market in Asia. In terms of size (0.78 lakh acres) and production (4.11 lakh tonnes), Guntur in Andhra Pradesh is the leading district. Guntur alone generates 15% of all the chiles produced in India (des.ap.gov.in, 2020).
There is a need to preserve and enhance the chilli output because it is one of India's principal spices and a significant export good. Farmers', traders', and consumers' interests must all be met for this to happen. Reaching their interests is really difficult in the traditional chilli marketplaces. (Syndicate dealers, reduced producers share in consumers rupee, high marketing costs, restricted number of customers, etc.). In order to best balance the interests of farmers, dealers, and consumers, the government has developed regulated markets (APMC) to overcome the challenges of the old chilli markets.
The Agricultural Product Markets Regulatory Acts govern agricultural markets in India (APMRA). India now has 7,190 licenced wholesale markets. Although the Act has been effective in bringing some order to agricultural markets over the previous few decades, complacency and rigidity in adapting to meet the requirements of the time have recently caused a great deal of frustration among farmers. The APMC Model Act is one of the most recent and significant revisions to the APMC Act that have been implemented over the years (2003). The states have, however, adopted these reforms in varying degrees.
The GoI chose to integrate all of the country's current APMC markets into a single electronic platform called e-NAM to create a national agriculture market (e-NAM), despite the fact that agriculture and agricultural marketing are a state topic.

By the end of the year, 250 APMC mandis from 10 states have been integrated into the e-NAM platform since its inception in July 2016. Although though e-NAM is a "virtual" market, a physical market exists behind the scenes. e-NAM is a tool to construct a nationwide network of physical mandis that can be accessed online, not a rival marketing organisation. By addressing market fragmentation, e-NAM hopes to reduce intermediary costs, waste, and pricing for the end user. Both local traders and dealers on the electronic platform based in other States may submit bids for the produce. The farmer has the option of accepting the online or local offer. In either scenario, the local mandi will record the transaction and continue to receive the transaction fee. In fact, there will be much more business since there will be more competition for certain produce, which will lead to increased transaction costs for the mandi.

In Andhra Pradesh, 7.97 lakh tonnes of dry chillies were produced in 2020–21. 6.07 lakh tonnes of dry chilies were traded through e-NAM in the fiscal years 2020–21. e-NAM facilitates transactions for an average of 76% of Andhra Pradesh's total dry-chilli production (APMC, Guntur). So, pursuing this study with the following objectives will be helpful to farmers and policy makers.

a. To study the determinants of e-NAM market participation of chilli (dry) farmers in Guntur district.
b. To study e-NAM market participation intensity of chilli (dry) farmers in Guntur district.
c. To study the constraints for e-NAM market participation of chilli (dry) farmers in Guntur district and offer relevant suggestions.

2. Materials and Methods

For this study, Andhra Pradesh state was selected as it is the leading producer of Chilli in India. Guntur district was taken as it has the highest production of Chilli (4.11 lakh tonnes) in Andhra Pradesh. Data on the yield and area under cultivation of chilli crop in the selected districts was collected from Chilli Outlook Report-January to May 2021, Agricultural Market Intelligence Centre, ANGRAU, Lam. The following tools were used for analysing the data obtained.

2.1 Probit Regression Model

Probit Regression Model is used to model binary outcome variables. The Probit model is employed to analyse the determinants of e-NAM market participation of chilli (dry) farmers in Guntur district.

Dependent variable: e-NAM market participation decision of chilli (dry) farmers in Guntur district. (1-decide to participate, 0- decide not to participate)

Independent Variables: Experience (Years), Education (Illiterate-0, Literate-1). Distance (Kms), Source of price information (1-if there is source of price information, 0- if there is no source of price information), Training received (1-if training received, 0- if training is not received), Transaction cost (Rupees).

2.2 Tobit Regression Model

The Tobit regression model is used to analyze the e-NAM market participation intensity of chilli (dry) farmers in Guntur district. The Tobit model is specified as.

$$y_i^* = x_i'\beta + \varepsilon_i$$

$$y_i = \begin{cases} y_i^* \; if \; y_i^* > 0 \\ 0 \; otherwise \end{cases}$$

ε_i is an independently and identically distributed normal random error and constant variance σ^2

$x_i'\beta$ are the vector of parameters and covariates to be estimated.

Dependent variable: Proportion of quantity of total production transacted in e-NAM.

Independent variables: Price (Rupees), Source of price information (1-if there is source of price information, 0- if there is no source of price information)**,** Awareness on quality measures (1-if there is awareness on quality measures, 0- if there is no awareness on quality measures)**,** Training received (1-if training received, 0- if training is not received)**,** Transaction cost (Rupees).

2.3 Garrett Ranking Technique

In this study Garrett ranking technique was used to study the constraints in e-NAM market participation of chilli (dry) farmers in Guntur district.

Garrett's formula for converting ranks into percent.

$$\text{Percent position} = \frac{100(Rij-0.5)}{Nj}$$

Where,

R_{ij} = Rank given for i^{th} constraint by j^{th} respondent.

N_j = Number of items constraints ranked by j^{th} respondent.

3. Results and Discussion

3.1 Probit Regression Model

The Probit model is employed to analyse the determinants of e-NAM market participation of chilli (dry) farmers in Guntur district. The results shown in table 4.2 infer that the pseudo R2 value showed that 69.66% variation in the dependent variable was explained by the selected independent variables.

Experience: It was found positive and statistically significant at 5% level. A marginal value of 0.0107943 indicated that the probability of participation in e-NAM increased by 1.07% with 1 year increase in farming experience.

Education: It was found positive and statistically significant at 1% level. A marginal value of 0.3908497 indicated that the probability of participation in e-NAM increased by 39% with 1 unit increase in education.

Distance: It was found negative and statistically significant at 5% level. A marginal value of -0.0051333 indicated that the probability of participation in e-NAM decreased by 0.51% with 1 km increase in the distance.

Source of price information: It was found positive and statistically significant at 5% level. A marginal value of 0.0450017 indicated that the probability of participation in e-NAM increased by 4.5% with every unit increase in source of price information.

Training received: It was found positive and statistically significant at 5% level. A marginal value of 0.1703323 indicated that the probability of participation in e-NAM increased by 17.03% with every unit of training received.

Transaction cost: It was found negative and statistically significant at 1% level. A marginal value of -0.000894 indicated that the probability of participation in e-NAM decreased by 0.08% with 1 rupee increase in transaction cost.

Table 1: Results of Probit regression analysis

Parameter	Coefficient	Standard error	p-value	Marginal value(dy/dx)
Experience	0.0764556	0.0377278	0.045	0.0107943*
Education	1.051508	0.3783643	0.004	0.3908437**
Distance	-0.0138103	0.0068104	0.041	-0.0051333*
Source of price information	1.3672308	0.6831154	0.049	0.0450017*
Training received	1.1638844	0.5819372	0.039	0.1703323*
Transaction cost	-0.00224	0.000109	0.001	-0.000894**
pseudo r2	69.66%			

Note: **Significant at 1% level and *Significant at 5% level

3.2 Tobit Regression Model.

The tobit regression model is used to analyse the e-NAM market participation intensity of chilli (dry) farmers in Guntur district. The results shown in table 4.3 infer that the pseudo R2 value showed that 53.4% variation in the dependent variable was explained by the selected independent variables. this indicated that the model showed a good fit to the data.

Price: Price of e-NAM was found positive and statistically significant at 1% level. A marginal value of 0.0019 indicated that the intensity of participation increased by 0.19% with 1 rupee increase in the price.

Source of price information: It was found positive and statistically significant at 1% level. A marginal value of 0.1478 indicated that the intensity of participation increased by 14.78% with every unit increase in source of price information.

Awareness on quality measures: It was found positive and statistically significant at 5% level. A marginal value of 0.0500 indicated that the intensity of participation increased by 5% with the 1 unit increase in the awareness on quality measures.

Training received: It was found positive and statistically significant at 5% level. A marginal value of 0.0020272 indicated that the intensity of participation increased by 0.2% with every unit of training received.

Transaction cost: It was found negative and statistically significant at 5% level. A marginal value of -0.000243 indicated that the intensity of participation decreased by 0.024% with 1 rupee increase in transaction cost.

Table 2: Results of Tobit regression analysis

Parameter	Coefficient	Standard error	p-value	Marginal value (dy/dx)
Price	0.0019	0.00095	0.006	0.0019**
Source of price information	0.147843	0.0232178	0.000	0.147843**
Awareness on quality measures	0.0500267	0.0216849	0.021	0.0500267*
Training received	0.0020272	0.0010136	0.028	0.0020272*
Transaction cost	-0.000243	0.000121	0.040	-0.000243*
pseudo r2	53.4%			

Note: **Significant at 1% level and *Significant at 5% level

3.3 Garrett Ranking Technique

Garrett ranking technique was used to study the constraints in e-NAM market participation of chilli (dry) farmers in Guntur district. The outcomes were shown in Table 4.4. More involvement of middlemen with a mean score of 68.40 is identified as major constraint faced by the farmers participating in e-NAM. It was followed by Presence of single market yard (65.29), High cost of transportation and storage (46.09), Formation of syndicates by middlemen (42.43), Excess commission than specified by the government (40.40) and Lack of information about e-NAM market prices (37.40).

Table 3: Constraints faced by adopter farmers

S. No.	Constraints	Total mean	Rank
1	More involvement of middlemen	68.40	I
2	Presence of single market yard	65.29	II
3	High cost of transportation and storage	46.09	III
4	Formation of syndicates by middlemen	42.43	IV
5	Excess commission than specified by the government	40.40	V
6	Lack of information about e-NAM market prices	37.40	VI

4. Conclusion and Suggestions

From the results obtained from the Probit regression analysis showed that the model was a good fit for the collected data. All the independent variables selected were statistically significant. Out of which experience of the farmer, education of the farmer, availability of source of price information and training received by the farmers related to e-NAM were found positive, implying that the probability of participation in e-NAM will increase when the experience of the farmer, education of the farmer, availability of source of price information and training received by the farmers related to e-NAM are increased. The distance of farm from the e-NAM market yard and transaction costs were found negative, implying that the probability of participation in e-NAM will decrease when the distance of farm from the e-NAM market yard and transaction costs were increased.

The results of Tobit regression analysis showed that the model was a good fit for the collected data. All the independent variables selected for this model were statistically significant. Among these independent variables price of chilli (dry) in e-NAM market, availability of source of price information, awareness on quality measures available in e-NAM and training received by the farmers related to e-NAM were found positive, implying that the intensity of participation of farmers in e-NAM increases when price of chilli (dry) in e-NAM market, availability of source of price information, awareness on quality measures available in e-NAM and training received by the farmers related to e-NAM were increased. However, transaction costs involved in

transacting chilli (dry) in e-NAM was found negative, implying that the intensity of participation of farmers in e-NAM decreases if the transaction costs increased.

The Garrett ranking technique revealed that the major problem faced by the farmers participating in e-NAM is More involvement of middlemen, followed by presence of single market yard, high cost of transportation and storage, formation of syndicates by middlemen, excess commission than specified by the government and lack of information about e-NAM market prices. These problems can be reduced by making some modification in the existing polices and also by implementing new polices. Some of the suggestions are given below.

The conclusions discussed above gave the following suggestions. They are, efforts should be made to develop a mobile app in the local language which can be used by the farmer-sellers. Specific slot may be given to the farmers through the app, who intends to sell their commodities. The farmers may input the details of the lot on the mobile app well in advance before coming to the mandi. Government should strengthen e-NAM markets by integrating all the mandies including rural markets and APMC mandies. All e-NAM mandis should be linked with Warehousing Development and Regulatory Authority (WDRA) accredited warehouses/cold storages. The e-NAM should be fully integrated with Artificial Intelligence and the Internet of Things (IoT) to provide real-time information. Mechanization of the activities after harvesting the produce should be implemented, so that the transaction costs may decrease. Well-developed road system linking the production areas and the e-NAM market yard should be provided for easy accesss of market yard.

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