Comments

Ascertain The Farmers and Traders' Willingness to Participate in eNAM: Binary Logistic Regression Analysis

ABSTRACT

National Agriculture Market (e-NAM) is an electronic trading portal that networks the existing APMC markets to create a unified national market for agricultural commodities. The main aim of the study[was] to determine the willingness of participates in e-NAM trading by farmers and traders in Sultanpur district of Uttar Pradesh. The primary data was collected through face-to-face interview with the help of survey schedule to find out the willingness, Binary Logit regression model was used. In which the explanatory variables of farmers were social category, age of the respondent, education, produce sold to arhatiya or village traders and distance from mandi according to analysis if education increased then willingness of farmers also increased with a coefficient of 3.27 similarly if the farmer is selling his produce to mandi arhatiya rather than a village trader then his probability to participate in e-NAM will increase by about 2.38 times. On other hand explanatory variables of Traders were social category, age of the traders, education level of traders, lending money to farmer, number of functions involved by traders in mandi and Business profits etc. All explanatory variables are significantly but only one variable which was not significantly i.e. Business profits because traders were afraid that their income will be known.

Keywords: APMC, binary logit regression model, e-NAM, e-Market, explanatory variables, virtual market.

INTRODUCTION

Agriculture plays a vital role in India's economy. 54.6 of the total workforces is engaged in agriculture and allied sector activities and accounts for 18.8% (First Advance Estimates) of country's Gross Value Added (GVA) for the year 2021-22 (at current prices). Given the importance of the agriculture sector, Government of India has taken several steps for its development in a sustainable manner as per Fourth Advance Estimates for 2020-21, total Foodgrain production in the country is estimated at record 308.65 million tonnes which is higher by 11.14 million tonnes than the production of foodgrain during 2019-20. Further, the production during 2020-21 is higher by 29.77 million tonnes than the previous five years' (2015-16 to 2019-20) average production of foodgrain (MAWF, 2021).

Marketing is the performance of all business activities involved in the flow of goods and services from the point of initial agricultural production until they are in the hands of the ultimate consumer (Khan and Khan, 2012). Agricultural marketing covers the services involved in moving an agricultural product from the farm to the consumer (Vedivelu and Kiran, 2013; Rajendran and Karthikesen, 2014). through time (storage), space (transport), form (processing) and transferring ownership at various levels of marketing channels (Rehman *et al*., 2012). Accelerating growth in agriculture to sustain high growth, production,

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The findings of the research was not explained well & also there was no recommendations or future line work

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and demand both must move alongside the marketing function. Producers as well as customer and consumer play a vital role in the functioning of market structure (Pani and Jena, 2020). The main source of raw material to agro industry is agriculture and these raw materials come from rural areas of the country. Agriculture marketing helps in meeting the demand and expectation of the consumers. It helps in raising income and improving the living standard of the rural people. The agricultural marketing supports the growth of the economy apart from the food and nutrition needs of the country (Acharya and Agarwal, 2011).

The Indian governments have paid more attention on improving coverage of irrigated land, increasing financial capabilities of farmers, reducing financial risk through Minimum Support Prices (MSPs), enhancing soil quality, mechanizing the harvesting process, and increasing the storage capacities. But there has been paid less attention on improving the post-harvest infrastructure of agricultural marketing that directly impacts the income realization and living standard of farmers-producers (Meena *et al*., 2019). Evolution of mankind can be seen in terms of technological evolution as well. In India agricultural marketing was governed by a set of public owned wholesale markets which were established during the colonial period under the APMC Act (Ghosh *et al*., 2021). Emerging changes in agriculture marketing environment of the country i.e., electronic market reforms Model Act, warehousing, pledge loan, contract farming is ushering in opportunities for new formats of marketing of agriculture and investment in infrastructure, technology, and capacity building (Yadav and Shalendra, 2017; Gupta and Badal, 2018). APMC markets were established with the good intention of facilitating fair market practices by introducing open outcry system of auctioning, they have become breeding grounds to exploit the farmers over the years (Chand, 2016). The problem is not APMC itself, but the state's failure to reform its APMCs, adopting technology and creating competition by encouraging private investment. Over the years, traders and commission agents have indulged in various malpractices such as collusion in bidding at lower price for the produce, under-weighment, delayed payments, and unauthorized deductions to the extent of 10–20 per cent of the value of the produce as market fees, commission, loading and unloading charges and involvement of too many intermediaries (Reddy and Mehjabeen, 2019). Realizing the urgent need to address the challenges of the existing agricultural marketing system, the Union Government introduced a Central Sector Scheme for Promotion of National Agriculture Market through a common electronic market platform, called the electronic National Agricultural Market or e- NAM on 14 April 2016 (Kalamkar *et al.*, 2019). The National Agriculture Market (e-NAM) was inaugurated in April 2016 with a view to eliminate middlemen and brokers. e-NAM as a software platform provides a forum for farmers to offer their produce and sell at a competitive price offered by different traders. In India most of the agricultural markets are functioning under state governments as agriculture is a state subject as per the constitution of India. The markets are regulated and run by the Agricultural Produce Market Committee (APMC) Act 2003 adopted by the state governments (Nair and Mehta, 2020).

e –NAM is a pan-India electronic trading portal which create a unified national market especially for agricultural commodities and provides single window service by networking existing APMCs (Agriculture Produce Marketing Committees) (Roshini *et al.*,

2018; Yadav and Sharma, 2015; Kumar *et al.*, 2016). The e-NAM portal provides a single window service for all APMC related information and services, including commodity arrivals, prices, bids and offers. Some of the expected benefits from e-NAM include accessibility of farmers to a common agriculture market, real time price discovery, transparency in the agriculture marketing system, reduce the transaction costs of buyers and sellers, real time information on prices, market arrivals, bidding on quality parameters of commodities, online bidding for more transparency, online payment system to reduce the payment risk and ensure timely payments to farmers, cleaning, sorting, grading and weighing facilities and additional services such as soil testing laboratories at the eNAM. E-NAM is a virtual market, but it has a physical market at the back end (Singh *et al*., 2021). While one time registration of farmers / sellers, lot details at the entry gate, weighment, quality assaying, auctions / trade transactions, payment by buyers to sellers and other agencies involved in the chain of transaction will take place online on e-NAM, actual material flow will happen physically through the market. Entire arrivals of agricultural commodities selected for trading on e-NAM will be traded on-line itself (Kalamkar *et al*., 2019).

Since April 2016, e-NAM has advanced significantly. So far, total 1000 Agriculture Produce Market Committee (APMC) markets have been integrated with e-NAM across 18 states & 3 Union Territories in the country. e-NAM has a total of 1,77,11,943 stakeholders of which 1.30 per cent are traders (2,31,203), 98 per cent are farmers (1,73,72,582), 0.59 per cent are commission agents (1,05,949) and 0.01 per cent are FPOs (2,209). About 193 commodities are listed in e-NAM. The commodities listed include 39 Fruits, 26 food grains, 57 vegetables, 14 oilseeds, 16 spices and 41 MISC. However, cereals and millets together contribute to a large volume of trade. In Uttar Pradesh e-NAM has a total of 33,59,815 stakeholders of which 1.05 per cent are traders (35,302), 98.6 per cent are farmers (33,15,705), 0.25 per cent are commission agents (8,537) and 0.004 per cent are FPOs 271(enam.gov.in). The aim of the study was to figure out to investigate farmers' and traders' willingness to participate in eNAM.

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MATERIALS AND METHODS

Sampling Technique

The research carried out in the Sultanpur district of Uttar Pradesh, the district and blocks were selected through purposive cum random sampling technique were applied for the investigation of farms. About 90 farmers and 30 traders were chosen from the APMC mandi. All the selected sample farmers were grouped into three categories of marginal, small and medium size of holdings. To justify the whole category of farm, a sum of 66 marginal, 14 small and 10 medium sizes of sample farms to study the willingness of e-NAM. The primary data were collected from both respondents (farmers and traders) through personal interviews with using of survey schedules and secondary data collected were from official website of e-NAM and market head office. Data were analyzed with certain statistical techniques.

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Analytical tools

Descriptive Statistics

Descriptive statistics provide simple summaries about the sample and about the observations that have been made. Statistics used in this study were Average and Percentage to provide an easily comprehensible summary of the data. (Kaushik and Mathur, 2014).

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To study the willingness of e-NAM by farmers and traders a binary logit regression model was used. Logistic regression analysis (LRA) extends the techniques of multiple regression analysis to research situations in which the outcome variable is categorical (Dayton, 1992).

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A logistic regression model was used to determine farmers' and traders' willingness to participate in e-NAM. Logit regression analysis or model was attempted to understand the willingness of farmers and traders to predict the probability of an event happening for an individual (Nitesh, 2018).

The logistic function is:

Logit (P) = $\text{In}\left(\frac{p}{1-p}\right) = \beta_0+\beta_1x_1+\beta_2x_2+\beta_3x_3 \ldots \ldots \ldots \ldots \ldots \ldots \beta_qx_q$

Where

β_0 = Constant/ Intercept

$\beta_1 \; and \; \beta_q$ = Probability of event occurring e.g., willingness to participate in e-NAM or Not

$\left(\frac{p}{1-p}\right)$ = Odd ratio (Odds represent the relative frequency with which different outcomes occur)

The willingness of farmers to e-NAM was studied by using a binary dependent variable which takes a value 1 if the farmers are willing to e-NAM and 0 if farmers are not willing to e-NAM. The explanatory variables were social category, age of farmer (in years), education level (in digit), buyer of produce (to Aratiya 1 or village traders 0) and distance from farm to e-NAM market (in kilometers),

The willingness of traders to e-NAM was studied by using a binary dependent variable which takes a value 1 if the traders willing e-NAM and 0 if traders are not accepting e-NAM. The explanatory variables were social category (UR/OBC/SC), age of farmer (in years), education level (in digit), lending money to farmer (Yes/No), Number of market functions involved (in digit) and business turnover (in rupees) per annum.

RESULTS AND DISCUSSION

A. Willingness to participate in e-NAM

1. Based on age group

As per their age group, Table 1 compares the willingness of farmers to participate in e-NAM. Total numbers of farmers in the age group below 30 to 40 years were 15 and among those 83.3 % were willingness to participate in e-NAM. For the age group of 40 to 50 years total count was 55 and 87.3 per cent among them were willing to participate in e-NAM. Similarly, for age group of above 50 to 60 years the proportion of people willingness to participate was 55.5 per cent. It is evident from the table that as age group rises the willingness to participate drops sharply.

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Table 1: Willingness to participate in e-NAM on the basis of age group

Age (Year)	Willingness to Participate in e-NAM		
	Yes	**No**	**Total**
30-40	15 (83.3)	3 (16.6)	18 (100.0)
40-50	55 (87.3)	8 (12.6)	63 (100.0)
50-60	5 (55.5)	4 (44.4)	9 (100.0)
Grand Total	75	15	90

(Figure in Parenthesis indicate the percentage)

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2. *Based on Land holding*

From Table 2, 89.3 percent of marginal farmers were willingness to participate in e-NAM, while 85.7 percent of small farmers were willingness to participate. Similarly, 70 percent of medium farmers expressed interest in participating.

Table 2: Willingness to participate in e-NAM on the basis of Land holding

Land holding	Willingness according to land size		
	Yes	**No**	**Total**
Marginal	59 (89.3)	7 (10.6)	66 (100.0)
Small	12 (85.7)	2 (14.2)	14 (100.0)
Medium	7 (70 .0)	3 (30.0)	10 (100.0)
Grand Total	78	12	90

(Figure in Parenthesis indicate the percentage)

It was clear from the findings that marginal size and small size land holders were quite interested to participate in e-NAM compared to medium size land holders.

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3. *Based on Higher Education in family*

From Table 3 illustrates about the highest education level and its comparison to their willingness to participate in e-NAM. No member among the farmer's families was illiterate. Family of farmers belonging to primary education group had total of 4 farmers and 75 per cent i.e., 3 farmers were willing to participate in e-NAM. The farmer's having secondary education as highest education counted to 31 and 77.4 per cent i.e., 24 farmers were willing to participate in e-NAM. The farmers having education up to graduation were 45 among them 93.33 per cent i.e., 42 farmers were willingness to participate in e-NAM. Similarly, the highest education level having post-graduation been 10 in number and 100 per cent of them were willingness to participate in e-NAM.

Table 3: Willingness to participate in e-NAM on the basis of Higher Education in family

Education	Willingness according to Education		
	Yes	No	Total
Illiterate	0	0	0
Primary	3 (75)	1 (25)	4 (100.0)
Secondary	24 (77.4)	7 (22.5)	31 (100.0)
U. G	42 (93.3)	3 (6.6)	45 (100.0)
P. G	10 (100.0)	0 (0.0)	10 (100.0)
Total	79	11	90

(Figure in Parenthesis indicate the percentage)

It was clear from the above results that with increasing level of education, willingness to participate in e-NAM also increases.

4. Based on farmers' income level

Table 4 shows the distribution of the farmers' income level and their willingness to participate in e-NAM. In the Table 4, 49 farmers' have income level of ₹ 1-1.5lakh of which 87.7 per cent of farmers (43 farmer's) were willingness to participate in the e-NAM, 15 farmer's had income between ₹ 1.5 lakh to ₹ 2 lakh of which 86.6 per cent farmers i.e., 13 farmers were ready to participate in e-NAM. Similarly, for group with income level above ₹ 2 lakh 88.7 per cent i.e., 23 farmers were willingness to participate in e-NAM.

Table 4: Willingness to participate in e-NAM on the basis of farmers' income level

Income	Willingness according to income

	Yes	No	Total
1-1.5 lakh	43 (87.7)	6 (12.2)	49 (100.0)
1.5-2 Lakh	13 (86.6)	2 (13.3)	15 (100.0)
Greater than (> 2 Lakh)	23 (88.4)	3 (11.5)	26 (100.0)
Grand Total	79	11	90

(Figure in Parenthesis indicate the percentage)

It was evident from the findings in the above Table 4 there is no direct relationship between income level and willingness to participate in e-NAM.

*5. **Based on farmers' family size***

Table 5 elaborates about the farmers' family size and their willingness to participate in e-NAM. Among the farmers in the category with family size less than 6, about 90.5 per cent of them were willing to participate in e-NAM. For farmers with family size of 6-12 members, about 87.6 per cent of them were ready to involve in e-NAM. Similarly, farmers with family size above 12 members had willingness percentage of about 83.3.

Table 5: Willingness to participate in e-NAM on the basis of farmers' family size

Family size	**Willingness according to family size**		
	Yes	**No**	**Total**
Less than 6	10 (90.9)	1 (9.0)	11 (100.0)
6 to 12	64 (87.6)	9 (12.3)	73 (100.0)
than 12	5 (83.3)	1 (16.6)	6 (100.0)
Grand Total	79	11	90

(Figure in Parenthesis indicate the percentage)

Thus, Table 5 depicts that highest number of farmer's who were willing to participate in e-NAM belongs to family size of 6 to 12 number.

B. Binary regression (Logit Model) of willingness to adopt e-NAM by farmers.

Explanatory variables for farmers are social category, age of the respondent, education, produce sold to arhatiya or village trader and distance from mandi.

The explanatory variables/ Independent variables those had significant positive influence on willingness to participate in e-NAM were farmer's social category, age of the respondent, education and produce sold to arhatiya or village trader.

Table 6: Factors affecting willingness of farmers to adopt e-NAM

Dependent Variable – Willingness to adopt e-NAM (Yes or No)			
S. No	**Independent Variable**	**Parameter Estimate**	**Standard error**
1.	Social Category	0.205**	0.513
2.	Age	0.930**	0.073
3.	Education	3.27**	0.479
4.	Buyer of Produce	2.381**	0.644
5.	Distance from the Mandi	1.000	4.494

**** Indicate statistical significance at the 5 % level**

The results of Logit regression indicates that social category, age of respondent, education of respondent, buyer of produce and distance from the mandi significantly affected the willingness to participate in e-NAM to sell their agricultural produce. From Table 6 it depicted that if a farmer was selling his produce to mandi arhatiya rather than a village trader then his probability to participate in e-NAM increased by about 2.31 times, more significantly if the age was increased by one year among the respondent, then the probability to participate in e-NAM decreased by 0.93 times. If the education of the farmer has increased then their willingness to participate in e-NAM was increased by 3.27 times. Variables those were statistically significant as well as negatively influencing willingness to participate in e-NAM for farmers were distance from the mandi.

C. Binary regression (Logit Model) of willingness to adopt e-NAM by traders.

Explanatory variables for Traders are social category, age of the respondent, education, lending money to farmer, number of functions involved in mandi and Business profits. The explanatory variables/Independent variables those had significant positive influence on willingness to participate in e-NAM were traders' social category, age of the respondent, education, lending money to farmer and number of functions involved in mandi.

Table 7: Factors affecting willingness of traders to adopt eNAM

Dependent Variable – Willingness to adopt e-NAM (Yes or No)			
S. No	**Independent Variable**	**Parameter Estimate**	**Standard error**
1.	Social Category	4.000**	1.50
2.	Age	0.619**	0.224
3.	Education	1.617**	0.417
4.	Business Profits	1.000	4.01
5.	Lending money to farmer	29.333**	1.276
6.	No. of market functions involved	24.385**	1.270

**** Indicates statistical significance at the 5 % level**

The results of Logit regression indicates that social category, age of the respondent, education, lending money to farmer and number of functions involved in mandi, affected the willing to adopt in e-NAM by traders. Table 7 indicates if the age was increased by one year among the respondent, then the probability to participate in e-NAM decreased by 0.61 times and If the education of the traders has increased then their willingness to participate in e-NAM was increased by 1.61 times. Similarly, when traders were more involved in the function of mandi the probability to participate in e-NAM increased by 28.05 times.

Variables that were statistically significant as well as negatively influencing willingness to participate in e-NAM i.e., Business profits parameter because traders were afraid that their income will be known.

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CONCLUSIONS

We reach a conclusion that the logit regression model for farmers showed that social category, buyer of produce, age of farmers, education, and distance from the mandi significantly affected the willingness to adopt and participate in e-NAM. The study revealed that as, education increased the willingness among farmers also increased with a coefficient of 3.27 which concluded that if the farmer is selling his produce to mandi arhatiya rather than a village trader then his probability to participate in e-NAM will increase by about 2.38 times. If the age is increased by one year among the farmers, then the probability to participate in e-NAM will be decreased by a coefficient of 0.205. Similarly, if the distance from the mandi increases then their willingness to participate decreases by a coefficient of 1.00. Variables negatively influencing willingness to participate in e-NAM for farmers was distance from the mandi.

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The willingness to participate in e-NAM was found to be significant in case of traders when analyzed through logit regression for various independent variables i.e., social category, age of traders, education, lending money to farmers and market function involvement except one independent variable which was found to be non- significant i.e., business turnover as traders were afraid that their income will turn transparent.

Comment [D21]: What is your recommendation & future work line?

REFERENCES

1. Acharya, S. S., and Agarwal, N. L. 2011. Agricultural Marketing in India (Fifth). New Delhi: Oxford and IBH Publishing Company Pvt. Ltd.
2. Chand, R. 2016. E-Platform for National Agricultural Market. *Economic and Political Weekly*, **51**(28): 15-18.
3. Dayton, C.M. 1992. Logistic regression analysis. *Stat*, 474, 574.
4. Department of Agriculture & Farmers Welfare Ministry of Agriculture & Farmers Welfare Government of India. 2021. PP-1.
5. Department of agriculture and farmers welfare, Ministry of agriculture & farmers welfare, Government of India. 2022. (Last Accessed 12 January 2023).

6. Ghosh, L., Sahoo, J.P., Nahak, S.K., and Samal, K.C. 2021. National agricultural market (e-NAM) for rebooting Indian farmers' economy. *Agriculture Letter,* **3**(4): 55-62.
7. Gupta, S., and Badal, P. S. 2018. E-national Agricultural Market (e-NAM) in India: A Review. *BHU Management Review*, **6**(1): 48-57.
8. Kalamkar, S.S., Ahir, K. and Bhaiya, S.R. 2019. Status of Implementation of Electronic National Agriculture Market (eNAM) in selected APMCs of Gujarat. *Progress*, 112.
9. Kaushik, M and Mathur, B. 2014. Data Analysis of Students Marks with Descriptive Statistics. *International Journal on Recent and Innovation Trends in Computing and Communication*, **2**(5): 1188-1191.
10. Khan, N., and Khan, M. M. 2012. Marketing of agricultural crops in rural Indian economy: A case Study. *Marketing*, ***3***(2).
11. Kumar, N., Kumar, A., and Tyagi, S. 2016. eNAM: Connecting farmers and traders. *Rashtriya Krishi, 11*, 61-62.
12. Meena, G. L., Burark, S. S., Singh, H., and Sharm, L. 2019. Electronic-National Agricultural Market (e-NAM): Initiative towards Doubling the Farmers' Income in India. *Intl. Archive of Applied Sci. and Tech*, **10**(2): 162-171.
13. Nair, D. and Mehta, S. 2020. e-NAM: An impact study on doubling farmers income 4th international conference on new horizons in science, *Engineering and management, and Humanities*, 662.
14. Nitesh. 2018. Economic study of national agriculture market (e-NAM) in Bikaner district of Rajasthan. M.Sc. Thesis, Swami Keshwanand Rajasthan Agricultural University, Bikaner, India.
15. Pani, S. K., and Jena, D. 2020. Agricultural marketing in India: a review on challenges and prospects. *Journal of Critical Reviews*, *7*: 4169-4174.
16. Rajendran, G., and Karthikesan, P. 2014. Agricultural marketing in India-an overview. *Asia Pacific Journal of Research*, *1*(XVII).
17. Reddy, A. and Mehjeeb. 2019. Electronic National Agriculture Market import, problems and way forward. *IIM Kozhikode Society and Management Review,* **8**(2): 143-155.
18. Rehman, S.U., Selvaraj, M., Ibrahim, M.S. 2012. Indian Agricultural Marketing- A Review, *Asian Journal of Agriculture and Rural Development,* **2**(1): 69-75.

19. Roshini, S., Sonali, S.B., and Mahapatra, U. 2018. E-nam in Agricultural Marketing-An Overview. *International Journal of Current Research*. **10**(2): 65276-65278.
20. Singh, D.P., Patil, C. and Meena, S.S. 2021. Impact of online agriculture marketing policy- e-NAM on prices and arrivals of agricultural commodities in Punjab, India. *International journal of current microbiology and applied science*, **10**(2): 2319-7706.
21. Vadivelu, A., and Kiran, B. R. 2013. Problems and prospects of agricultural marketing in India: An overview. *International journal of agricultural and food science*, **3**(3): 108-118.
22. www.eNAM.gov.in
23. Yadav, H., and Shalendra. 2017. ODISHA- Linking Farmers to Electronic Markets (ENAM) Current Scenario and a Way Forward.
24. Yadav, J. P., and Sharma, A. 2017. National agriculture market: the game changer for Indian farming community. *Journal article*, 5810-5815.

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