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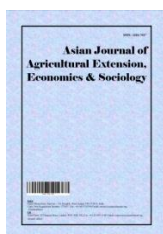
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Constraints in the Diffusion of E-NAM and the Policy Measures

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2021/v39i1130716

Editor(s):

(1) Dr. Wang Guangjun, Chinese Academy of Fishery Sciences, China.

Reviewers:

(1) D. Thirumala Rao, Osmania University, India.

(2) P. S. Venkateswaran, PSNA College of Engg & Tech, India.

(3) Pooworakulchai Chaiwat, Ramkhamhaeng University, Thailand.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/74610>

Original Research Article

Received 15 July 2021

Accepted 24 September 2021

Published 12 October 2021

ABSTRACT

The study's major goal is to look at how prices and market arrivals have changed before and after the installation of e-NAM, as well as the challenges that stakeholders experience in adopting this technology. Based on the facilities gained from the designated APMCs linked with e-NAM through personal interviews, data from randomly selected farmers and dealers, cum commission agents, and committee officials was collected. Several users were interviewed in order to achieve this goal relating to various challenges faced by e-NAM stakeholders while participating in the process of selling and buying through the e-NAM site. Farmers in the selected APMCs faced significant challenges due to the complicated and time-consuming method of trading in the e-NAM system, a lack of knowledge about e-trading (farmers frequently do not understand the meaning displayed in the machine), and frequent visits to the bank for payment realisation.

Keywords: Adoption; payment realization; APMCs; commission agents; online transactions.

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1. INTRODUCTION

1.1 Data Collection

1.1.1 Sampling design

Purposive and random sampling technique was followed in the study. For selecting different markets (e-NAM and non-e-NAM) and respondents like farmers, traders cum commission agents and market committee officials etc. purposively and random sampling procedure was adopted. The study is based on primary data from different markets and selected respondents. Haryana state was selected purposively for the present study. The study is based on e-NAM linked markets and non-e-NAM markets in Haryana. The e-NAM system was adopted in Haryana launched in April 2016 along with eight different states across the country by linking APMCs with e-NAM platform for providing a single unified market.

1.2 Selection of APMCs (Mandis)

Haryana state consisted of 113 mandis. Out of 113 there are 54 APMCs in Haryana which are linked with e-NAM. For the study purpose 15 mandis enrolled with e-NAM and 15 control markets (non-e-NAM) from Haryana were randomly selected.

Out of these 113 regulated markets which have already been 54 connected and others have to be linked with e-NAM platform in future. A total of 30 markets with 15 e-markets as treatment (e-NAM) and another 15 as control (non-e-NAM) were selected for data collection to know the impact of e-markets.

1.2.1 Selection of markets, farmers and traders

There are three major stakeholders in the e-NAM system: - farmers, traders or commission agents (CAs) and buyers/processors/ exporters. The registration and operational procedures for stakeholders, like farmers, commission agents and traders etc. and procedures for using e-NAM mobile application for different stakeholders for improvement of mandis under e-NAM.

1.2.2 Period of study

Primary data were collected from the selected respondents from different selected respondents

from different selected e-NAM and non-e-NAM markets for the agricultural year 2019-20.

1.2.3 The nature and sources of data

From primary sources the data required for the present study were collected.

1.2.4 Primary data

Using separate specifically designed and pre-tested schedules for farmers, traders cum commission agents and APMCs officials the primary data required for the present study were collected. Each respondent was interviewed personally through interview schedule. The data on socio-economic aspects, functioning of markets and constraints etc. were collected from selected respondents.

1.3 Data Framework

On variables like age, gender, farm size, family size, education, village, crops grown, frequency of visit to mandi, commodities brought to selected markets, quantity of different commodities brought to APMC, marketing costs, price realized etc data were collected from farmers. Data regarding farmer's understanding about selected markets functioning and constraints were also collected. Information with respect to inspirational variables affecting farmer's inclusion in e-NAM stage were similarly gathered.

1.3.1 Analytical tools for analysis of data

To evaluate the objectives of the study, based on the nature and extent of data availability, the following analytical tools were employed for processing the data from selected respondents to draw the meaningful results and conclusions.

1.4 Descriptive Analysis

Percentages and tabular analysis were done to study the socio economic profile of selected respondents in the study area. The socio economic characteristics such as age, education, of farmer, traders cum commission agent, family size and land holding etc. the descriptive statistics was employed. Further, the collected data were tabulated and interpreted in the view of cited objectives by absolute change, relative change, average, standard deviation, coefficient of variation and difference in difference technique as below.

1.4.1 Absolute change

It describes the simple overall difference after amalgamation of e-NAM platform with selected mandis it was calculated as under

$$\text{Absolute change} = Y_n - Y_o$$

Where,

Y_n = after the implementation of e-NAM at APMCs

Y_o = before the implementation of e-NAM at APMCs

1.4.2 Relative change

Relative change explains the proportional/comparative change between before and after implementation of the e-NAM system at the selected markets, therefore relative change was used.

$$\text{Relative change} = \frac{\text{Absolute change}}{Y_o} \times 100$$

1.4.3 Average (mean)

The average or mean expresses the central value in a set of data.

$$\text{Mean} = \frac{\sum X}{n}$$

Where,

$\sum X$ = total sum of observations

n = total number of observations

1.5 Constraints Faced by Farmers

Constraints faced by farmers in the e-NAM system as shown in the table 3. Farmers' major problems in the selected APMCs included a complex and lengthy process of trading in the e-NAM system, followed by multiple visits to the bank for payment realisation, a lack of awareness about e-trading, and farmers' inability to understand the context displayed on the computer and projector screen. 82 per cent of the farmers felt the lack of proper dissemination of information and lack of guidance, 62 per cent farmers reported complications in sale process, sometimes power failures, inadequate number of computers during high quantity of commodity arrivals at the harvesting period. Delay in online payments and difficult online payment process were faced by 96.7 and 58 per cent of the

farmers respectively. 68 per cent of farmers reported for unavailability of adequate assaying laboratory. 65.3 per cent farmers highlighted the insufficient number of computer operators at the mandis during peak periods of market arrivals. Whereas about 60 per cent of the farmers reported difficulty in price realization. (Table 1).

The main difficulties faced by the farmers in the selected APMCs were due to the complex and extended process of trading in the e-NAM system, lack of awareness about e-trading, farmers sometimes do not understand the context displayed in the computer, and numerous visits to the bank for payment realisation.

The results were in conformity with the findings of Mueller [1] in which he explained the role of e-commerce in agriculture sector covering approachability of e-commerce to the farmers. Basha [2] also reported in his study that due to illiteracy, ignorance and financial weakness, the farmer possessed a weak bargaining power and lack of practical knowledge. Vedivelu and Kiran [3] also reported that the need was felt to create awareness among the farmers through the agricultural extension agencies. Mohan [4] also stated that e-NAM had some teething problems due to resistance to change the 70-year-old commission agent-backed system. Verma *et al.* [5] also observed that most of the farmers were still using traditional ways of cultivation and marketing due to lack of awareness and their remote locations. Roshini *et al.* [6] also observed that the farmers are not aware of e-NAM. Reddy [7] also reported fear of taxation of online transactions. Shekhar and Bhatt [8] also reported delay in online transactions as similar as in the present study. Nuthalapati *et al.* [9] reported the elimination of resource poor and uneducated farmers, lack of infrastructure as well as short-term credit in regulated markets and irrelevant diffusion of electronic market transactions do not encourage confidence on its facility to help overcome market failures.

1.6 Constraints Faced by Traders Cum Commission Agents

Table 2 shows the constraints experienced by traders and commission agents in the e-NAM system in the selected APMCs. From the traders' perspective, the difficulty of purchasing produce without physical inspection, the complexity of e-trading in comparison to open auction, and the time-consuming process of the e-NAM system were the key restraints they faced in the APMCs. The traders demanded a personal check of the

products because they were dissatisfied with the grading done in the assaying laboratory. They are also limited by a lack of adequate training in the e-NAM system, the complexity of e-NAM trade, limited bidding time, and last-minute bidding. 100 Per cent of the traders highlighted no proper dissemination of information, 80 per cent of traders reported complexity of sale process, sometimes power failures, inadequate number of computers during high quantity of commodity arrivals at the harvesting period, 14.7 per cent reported the lack of trained personnel to help them with e-NAM, 85.3 percent of traders faced delay in online payments, and 80 per cent & 60 per cent of traders reported for unavailability of adequate assaying laboratory & firm quality parameters respectively. 78.8 per cent of traders cum commission agents reported difficulty in online payment process. About 89.3 per cent of respondent traders faced difficulties in getting license for trading.

The difficulty of purchasing product without physical inspection, as well as the complexities of e-trading, are the key restraints faced by

merchants in the APMCs, as opposed to the open auction approach. Physical examination of product was necessary by traders because they were dissatisfied with the grading done in the assaying laboratory. They were also limited by a lack of proper training on the e-NAM system, problems in e-NAM trade, limited bidding time, and last-minute bidding.

Similar findings were observed by Tyngkan [10] who reported in his study Impact of electronic national agriculture market (e-NAM) on the income of farmers in Raipur, Chhattisgarh. Gupta and Badal [11] also reported in his study about e-NAM in India: and captures that there were various challenges in the implementation of e-NAM. Shekhar and Bhatt [8] also reported the similar results in their study in e-NAM: a review of performance and prospects in Haryana that most of the traders were not in the favor of e-NAM. Chaudhary and Suri [12] also reported the similar results in their study that there were difficulty faced by traders in adoption of e-NAM platform for transforming agricultural marketing in India.

Table 1. Major problems faced by farmers at the e-NAM

Problems faced at the e-NAM by the farmers	Numbers of respondents (n=150)
Lack of proper information transmission.	124(82.7)
Sale process is complicated	93(62)
No trained personnel to help with e-NAM	90(60)
No proper assaying laboratory	102(68)
Quality parameters are firm	78(52)
Delay in online payment	145(96.7)
Difficult online payment process	87(58)
Price realization is difficult	90(60)
Insufficient number of computer operators	98(65.3)

Primary respondent survey (2018-19); Note: Figures in parentheses represent per cent to total

Table 2. Major problems faced at the e-NAM – traders cum CAs

Problems faced at the e-NAM by the traders cum CAs	Number of respondents (n=75)
No proper dissemination of information	75(100)
Sale process is complicated	60(80)
No trained personnel to help with e-NAM	11(14.7)
No proper assaying laboratory	60(80)
Quality parameters are firm	45(60)
Delay in online payment	64(85.3)
Difficult online payment process	59(78.7)
Price realization is difficult	51(68)
Insufficient number of computer operators	45(60)
Difficulty in getting license	67(89.3)

Source: Primary respondent survey (2018-19); Note: Figures in parentheses represent per cent to total

Stakeholder constraints in the generation of lots - Stakeholders face challenges at the very beginning of the e-NAM process due to a lack of awareness about the scheme, poor infrastructure at the mandis, a complicated registration process, and the lack of a unique identity. Stakeholder Constraints in Quality Assessment - Stakeholders prefer for conventional methods of selling goods due to a lack of infrastructure, such as equipment, labour, and space for quality assaying (QA). Disagreements among stakeholders are also caused by merchants' or purchasers' full lack of trust in one another. Due to a paucity of people at the mandis, administering peak loads or large quantities of product arrivals is problematic. Faulty quality assaying is also caused by discrepancies between traditional and automated quality assaying techniques. Stakeholders in e-auctions encounter a number of challenges. During the auctioning process, essential information is unavailable due to a lack of IT infrastructure; this results in distrust among traders. Furthermore, the e-auction procedure has a large opportunity cost for merchants and takes significantly longer than the traditional method. Payments and settlement constraints posed by stakeholders - Stakeholders' lack of confidence and apprehension about using technology drives them to opt for the traditional mode of sale. Farmers demand cash payments to fulfil immediate needs, and 96.7 percent of farmers indicated that online payments are delayed, discouraging them. Digital payments, in addition to the payback of informal loans obtained via commission agents, are a barrier.

1.6.1 Problems faced at e-NAM mandis from the perspectives of market committee officials

According to the mandi representatives, farmers have insufficient understanding and understanding of the e-NAM programme, its benefits, and the value it provides to them. This causes farmers to lose interest in the scheme and discourages them from trading through e-NAM. They also noted that the majority of farmers are uncomfortable with technology and computers.; 86.7 per cent (Table 3) of the mandi officials agreed on the lack of necessary infrastructure at the mandi, such as proper entry gates, an insufficient number of live work stations, weighing bridges connected to e-NAM, and qualified people at the gates, all slow down the procedure. The time it takes to produce a unique lot number grows as well. This could

result in long lines and dissatisfaction among participants during peak hours.

There is no unique identifier for pre-registered farmers, according to all mandi administrators. If they search by name or phone number, they will encounter difficulties and delays. This happens every time the seller comes back to the mandi. Farmers are terrified of receiving direct payments in their accounts, according to about 27% of mandi authorities. Many farmers have taken out personal loans, automobile loans, KCC loans, and other types of loans from various institutions and have not paid them back. They are concerned that if payments are made straight to their accounts, the banks will deduct the unpaid loan amounts. In the past, the Pradhan Mantri Fasal Bima Yojana premium was deducted from their accounts, without their consent. Managing peak load or high quantity arrivals in the selected e-NAM mandis is difficult due to inadequate infrastructure, such as equipment, staff, and space for quality assaying (QA), according to all mandi officials. Poor internet access in the mandi and a shortage of Wi-Fi routers in e-auction platforms and halls, according to 86.7 percent of mandi officials, are preventing the use of e-auctioning. When compared to the present manual auctioning method, e-auction is a time-consuming operation. The e-NAM software's flaws, such as sluggish responsiveness and inadequate server connections, among other things, increases the difficulty factor.

Due to glitches in the e-NAM software, payment options such as net banking, debit card, and credit card are not always displayed on the e-NAM website. The system displays a blank sales invoice right away. This is a terrible use-case that prevents traders from using CAs to make online payments. Around 60% of the mandi delegates mentioned a lack of IT infrastructure. The inability of essential information to be accessed during the auctioning process breeds distrust among dealers and CAs. The e-auction procedure takes much longer than the traditional method. The total system is slowed by a lack of proper infrastructure at the mandi, such as proper entry gates, proper weighing bridges connected to e-NAM, and qualified people at the gates. It also increases the time spent to generate an individual lot number.

This could result in long lines and dissatisfaction among stakeholders throughout the harvesting period. Furthermore, mandis lack all of the necessary equipment for assaying (moisture metre, sieves, oven, test tubes, pipette,

chemicals, grinder, weighing machine, and so on), in addition to inadequate internet connections and the lack of wi-fi routers at e-auction and halls. Due to the lack of sufficient infrastructure, e-auction is a lengthy process when compared to the current physical auctioning method. The difficulty factor is increased by flaws in the e-NAM programme, such as delayed responses and inadequate server connections, among other things. Poor internet facilities at the mandi and the lack of adequate venues, according to 60% of the mandi officers, are preventing the use of e-auctioning; e-auction is a time-consuming process comparable to the manual auctioning procedure now in use. The period is extended due to flaws in the e-NAM programme, such as delayed responses and inadequate server connections, among other things. Furthermore, 86.7 percent of mandi administrators stated that merchants and CAs had little faith in technology and online payment systems. One of the most significant reasons for this is their lack of knowledge and training in the area of online payment processing. Traders do not rely on e-NAM when auctioning because the portal does not display an image of the commodity. They also don't believe the mandi officials' quality report on the e-auction platform. Farmers need cash payments, according to almost all mandi officials, because they need money right once to pay for things like hiring a trolley, paying tulawatis (licenced people who weigh commodities at the mandi for a charge), etc, and the purchase of farm inputs for the following cropping season, both of which are not available on the e-NAM platform. Farmers

take short-term loans from CAs, according to all mandi officials. Farmers may not repay the money they have borrowed if e-NAM is implemented, according to CAs, because they will receive money directly into their bank accounts.

For farmers to double their income, online marketing of agricultural products is considered critical. It is critical to digitise the agriculture sector in order to protect farmers from distressed selling. Online marketing of produce via the e-NAM system is a huge step forward in this sector in terms of protecting our farmers. India has the world's largest mobile phone population. The majority of this industry's difficulties can be remedied using the internet's capabilities.

Similar findings were observed by Gupta and Badal [11] also reported in his study about e-NAM in India: a review the research captures various challenges in the implementation of e-NAM. Reddy [7] have also reported in his study that the experience of e-markets in Karnataka since 2012, with the objective to suggest improvements to e-NAM. Shekhar and Bhatt [8] also reported the similar results in their study in e-NAM: a review of performance and prospects in Haryana and observed that two-thirds of the traders answered e-NAM is either worse than the physical mandis or there is no modification in post e-NAM period. Chaudhary and Suri [12] also reported the similar results in their study examined the constraints faced in adoption of e-NAM platform for transforming agricultural marketing in India.

Table 3. Problems faced at e-NAM mandis from the perspective of APMC officials

Problems faced at e-NAM mandis	Respondents (n=15)
Lack of awareness of e-NAM scheme	15(100)
Farmers uncomfortable using technology/computers	15(100)
Inadequate infrastructure	13(86.7)
Complex registration process	14(93.3)
No unique identifier	15(100)
Lack of trust of traders cum CAs and buyers	4(26.7)
Managing peak load is difficult	15(100)
Glitches in e-NAM software	13(86.7)
Undeveloped IT infrastructure	9(60)
e- auction takes much longer than conventional process	9(60)
Lack of trust in technology	13(86.7)
Farmers need cash payment to meet immediate expenses	15(100)
Digital payments are barrier in repayment of informal loans taken by the farmers from commission agents	15(100)

Primary respondent survey (2018-19); Note: Figures in parentheses represent per cent to total

As a result, despite the numerous bottlenecks and challenges encountered throughout the installation of the e-NAM platform, substantial progress and improvements have been made, with an increasing number of markets being linked to the e-NAM site, not only in Haryana but across the country. Although e-NAM had a beneficial impact on costs, arrivals in the selected e-NAM mandis decreased slightly. Some policy ideas can be made based on the changes that have already been achieved and the lessons learned.

2. CONCLUSION

Almost 82 per cent of the farmers felt the lack dissemination of information, 62 per cent farmers reported complications in sale process, delay in online payments and difficult online payment process were faced by 96.7 and 58 per cent of the farmers respectively. Moreover, nearly 100 Per cent of the traders highlighted lack dissemination of information, 80 per cent of traders reported complexity of sale process, 14.7 per cent reported the lack of trained personnel to help them with e-NAM, 85.3 percent of traders faced delay in online payments. In addition, about 89.3 per cent of respondent traders faced difficulties in getting license for trading and about 86.7 per cent of the mandi officials agreed on lack of adequate infrastructure at the mandi, 27 per cent told that farmers are afraid to get direct payments in their accounts, 60 per cent pointed out undeveloped IT infrastructure and about 86.7 per cent specified that traders cum CAs lack confidence in technology and in online payment arrangements. Whereas most preferred medium of crop sale by farmers during post e-NAM period is commission agents. However, all sampled farmers preferred e-NAM to sell the crops in post e-NAM period. Apart from that, majority of the farmers were aware of e-auctions and computer entry. while most of the farmers were satisfied with the e-NAM concept but traders cum commission agents did not favour it. Although none of the farmer or trader reported timely payments in e-NAM system.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/74610>