Evaluation of e-NAM Adoption: A Case of *Jetalpur Mandi*, Gujarat

Gaurav Mishra and Nityesh Bhatt

Abstract Electronic-National Agriculture Market (e-NAM) is being implemented in India to promote uniformity, streamlining of procedures across the integrated agricultural markets. e-NAM aims to reduce information asymmetry between buyers and sellers and facilitate the provision of real-time price discovery. Through a pilot study of the project in *Jetalpur mandi*, Gujarat, the authors intend to bring out the issues and challenges in adoption and implementation by various stakeholders of e-NAM. The study concludes that for e-NAM's successful adoption, aspects related to observability, relative advantage, compatibility, trialability and complexity are important and should be considered in the design of existing and future e-NAM centres.

Keywords IT in agriculture · ICT for development · e-NAM

1 Introduction

Sustained food and nutritional security is a big challenge for the growing population in today's world. According to Wani et al. [17], in India, around 1.4 billion people have to be fed by 2025. Hence, the ever-increasing demand for food puts immense pressure on the agriculture production. The land availability for agriculture is limited, and therefore, better crop production strategies have to be in place to match the ever-increasing food demand. There are many challenges being faced by farmers in the Indian context, for example, crop failures, animal illness lack of credit, lack of irrigation facilities and reliable agriculture-related information. In the literature (e.g. [4]), lack of infrastructure and connectivity technologies has also been cited as the factors which prevent the reach of the right information at the right time to farmers.

G. Mishra
Development Management Institute, Patna, India
e-mail: gmishra@dmi.ac.in

N. Bhatt (✉)
Institute of Management, Nirma University, Ahmedabad, India
e-mail: nityesh@nirmauni.ac.in

According to Sachan et al. [13], marginal reductions in the post-harvest losses may bring great relief on the food security front as well as improve the income level of the farmers. Marketing of most farm products generally involves many operations and processes through which the food and raw materials move from the cultivated farm to the final consumers. Agricultural markets have grown in size and complexity. Information provision to farmers can play a significant part in improving the livelihoods of farmers. Agriculture could benefit tremendously with the applications of information and communication technologies (ICTs), especially in enhancing socio-economic conditions of farmers. New marketing channels are coming up by both public and private stakeholders and these stakeholders are playing new and evolving roles [16].

In India, Agriculture Produce Marketing Committee (APMC) Act was enacted to enhance market efficiency, increase transparency and protect rights of farmers [7]. On the whole, the APMC Act has helped in getting rid of several malpractices and imperfections in agricultural markets. In addition, it has aided in the creation of orderly and transparent marketing conditions and ensured a fairer deal to farmers selling their produce [1].

However, in the literature, there are indications that the APMC Act has not been able to overcome some of the challenges faced by farmers. Few researchers believe that selling at a designated place, i.e. yard of a *mandi,* has its own disadvantage [2]. Once agricultural produce has been brought to it, it is seldom taken back in the event of an unfair deal. Hence, loss to farmers is difficult to avoid. According to Kumar et al. [5], few 'licensed' or 'registered' participants/agents/traders have a control on the markets and the Act became a deterrent to the development of competitive markets.

2 Electronic-National Agriculture Market (e-NAM)

e-NAM is an electronic trading portal which links the existing APMC *mandis* to create a unified national market for agricultural commodities. All the APMC-related information and services can be gathered from the e-NAM portal. Types of information which can be accessed from portal are: commodity arrivals and prices, buy and sell trade offers, provision to respond to trade offers, among other services. In addition, the portal helps to reduce transaction costs and information asymmetry. According to the information available on the e-NAM website, e-NAM's objective is to provide an integrated market through an electronic platform for efficient flow of agricultural commodities, both at state and at national level. The platform also aims to improve the agricultural supply chain by reducing information distortion between farmers and traders, providing real-time commodity price to farmers and uniformity of procedures across the integrated markets. Through e-NAM, the auction process will be made transparent with the provision of online payments. In addition, it will help the consumers to avail better quality commodity at a reasonable price. e-NAM software is developed by National Informatics Centre (NIC), Hyderabad.

Small Farmers' Agribusiness Consortium (SFAC) at the national level provides guidelines for setting e-NAM. At the state level, State Agriculture Marketing Board implements e-NAM. The monitoring of e-NAM implementation is done by the Board of Governors and Director of APMC. According to the project officials, Ministry of Agriculture pays for the integration costs, customization of software, training, etc., for local *mandis*. Rs. 30 lakhs is provided by the central government and provision of Rs. 30 lakhs is made by the respective state government for setting each e-NAM centre. e-NAM software is installed at each centre by technical support of Nagarjuna Fertilizers and Chemicals Limited (NFCL). The government has entitled SFAC as the lead promoter of e-NAM. At every *mandi*, a laboratory will be established by the government for quality assessment of the commodity to be traded. The laboratory will provide a certificate and potential price of the commodity based on the quality of the commodity.

Through an open tender, NFCL has been selected as a strategic partner (SP) for development, maintenance and support of the e-NAM platform. SP's role is to write software, customize it based on the requirements of *mandis* in states and run the platform. Parameters for quality testing of 69 commodities have been set by SFAC. Initially, the laboratories will do testing of a single commodity, and in future, testing for more than one commodity will be done. Presently, 455 *mandis* across 13 states are live on e-NAM platform.[1] To facilitate commodities trading on e-NAM, common tradable parameters have been developed for 25 commodities. Total 585 e-NAM *mandis* have to be set by the year 2018. Presently, 250 APMC of 10 states have been integrated into NAM platform. After registration in e-NAM, traders are provided username and password. Using these credentials, traders are able to do buying and selling of commodities. According to the e-NAM website, it is necessary for the states to have a single unified licence which is valid across the state, electronic price discovery mechanism and a single point charge of market fee. The states/UTs which follow the above criterion may benefit under the scheme. In addition, the states have to carry marketing reforms as per the provisions laid in the APMC Act and rules and develop requisite ICT infrastructure with respect to e-NAM integration. Also, the State Marketing Boards/APMCs must create awareness for the e-auction platform.

3   Research Methodology

As there is not much information on e-NAM available in the literature, this study is exploratory in nature. Through a pilot study of the project in *Jetalpur mandi*, Gujarat, the authors intend to bring out the issues and challenges in adoption and implementation of the electronic platform by farmers and APMCs. *Jetalpur mandi* was selected for the study as it is the only *mandi* which has adopted e-NAM in Ahmedabad district. Ahmedabad district was chosen because it is the biggest city in

---

[1]Source: http://www.enam.gov.in/NAM/home/implemented_progress.html,   accessed   on 03/02/2017.

Gujarat and has convenience of access to the project site. For the study, the authors conducted semi-structured interviews with various project stakeholders, i.e. project officials based at *Jetalpur* as well as from state headquarters based at Gandhinagar, farmers, *mandi* agents and traders. Authors also interacted with officials (local and state levels) from the implementation agency, i.e. NFCL. In addition, other infrastructure support providers (ex. Internet bandwidth) were also contacted for technical inputs.

4 e-NAM in Gujarat

The Gujarat Agricultural Produce Markets Act, introduced since 1963, is implemented in Gujarat for the regulation of agricultural marketing for the development of existing markets and establishment of new market yards. In Gujarat, there are 225 *talukas* (administrative division of India within a district) having *mandis* where agricultural produce is brought for sale. Under the provision of the Act, 207 market committees have been established in Gujarat. There are 190 principal market yards and 222 sub-market yards under the market committees. Presently in Gujarat, 40 *mandis* have enrolled under e-NAM, and according to the project officials, 25 new e-NAMs are to be set in Gujarat. The selection of e-NAMs is based on the volume of transaction done in various APMCs and also on the type of commodity traded. APMCs where fruits and vegetables are traded are not integrated with e-NAM. In Gujarat, major e-NAM centres are located in *Jetalpur, Jasdan*, *Botad*, *Himmatnagar*, *Jamnagar*, *Vijapur*, *Deesa*, *Gondal*, *Tharad*, *Junagadh*, *Mauva* and *Visnagar*. The implementation of e-NAM will be completed in three phases. In the first phase, local farmers will have the provision to trade locally. In the second stage, they will be in a position to trade at the state level. In the third phase, farmers will be able to trade at the national level.

4.1 About *Jetalpur* Mandi

Jetalpur mandi was started in the year 2007 and is semi-government in nature. e-NAM project in *Jetalpur mandi* was adopted in September 2016. Rice and wheat are the major commodities traded at *Jetalpur* market yard. During the season, 600–700 tractor loads of rice are brought to market yard. There are three seasons of rice, and hence, *mandi* trading for rice is more compared to wheat. On an average, 100–150 tractor loads of commodities come to the market yard daily. The *mandi* works 24 h, i.e. commodity may come and go out the *mandi* at any time. However, an auction takes place from 10.00 a.m. from Monday to Saturday. All the payments to the APMC are done during working hours. Presently, there are 12 employees at the *mandi*.

There are 72 registered traders for e-NAM out of 117 traders (registered by APMC office). Farmers from other districts also come to *Jetalpur* for trading because of two

reasons. First, they get a better price due to the presence of a large number of traders in this *mandi*. And second, traders are prompt in giving the agreed amount to farmers, usually in the form of a cheque for a larger amount and cash for a smaller amount. Traders pay a charge of Rs. 0.80 for every Rs. 100.00 of the transaction to the market yard. For gate pass, traders pay Rs. 50 for small vehicles and Rs. 100.00 for larger vehicles. Farmers need to pay Rs. 20 for the gate pass. With respect to the IT infrastructure, e-NAM in *Jetalpur* has: 10 personal computers (8 working) with configuration—Operating System: Windows 10, RAM: 10 GB, Processor: AMD A8 PRO 7600B, 10 cores, 3.10 GHz, 64 bit and X64-based processor; two laser printers; five tablets; one laptop; battery backup for the systems of 8 h; and Internet connection with a bandwidth of 6 Mbps. e-NAM operation at *Jetalpur* is manned by three employees, of which two (on the payroll of NFCL) are working as an analyst. They manage e-NAM transactions, handle challenges with software and send periodic reports to NFCL. The third employee looks after the overall administration of e-NAM. Ishaan Group, a private IT company, provides technical support to e-NAM in Gujarat.

4.2 Process Flow for the Commodity at e-NAMs

According to the e-NAM project officials, e-NAM follows a definite process for trading. The step-wise process flow in e-NAM is:

1. **Gate Entry and lot management**: When a farmer comes to a *mandi*, he/she is given a gate pass. The gate pass has details such as time and date of arrival, the name of the farmer, type of vehicle, weight of the vehicle type of produce and gate pass number. When the vehicle passes through the gate, the commodity brought by farmers has to placed/stored correctly. This is important as there should be no loss of commodity to farmers due to mishandling.
2. **Sampling and Assaying**: During sampling and assaying, a sample of the commodity is taken and is tested for quality. The price of the commodity is set based on the quality parameters. It is time-consuming process and is implemented only in few states like Uttar Pradesh, Rajasthan and Chhattisgarh.
3. **Approval for trade**: After sampling and assaying, based on assessed quality approval is given for trade. However, in Gujarat, the sampling and assaying do not happen. Hence, trade is approved for all the commodities which have gate entry pass.
4. **Bidding and weighment**: There are three parts to bid declaration, i.e. bid creation, actual bidding and bid declaration. Bid creation is of two types—open bid and closed bid. In an open bid, both farmers and traders know the final price. In a closed bid, there is a minimum bid set by APMC and farmers know the price. Last bid cannot be seen by the traders. Multiple bids can be placed by traders, and through auto assign functionality of the e-NAM software, the winner is declared by the APMC staff. Bidding is done on the trader's portal. Bid declaration is of

three types: publish the result, bid extension and exit bid. In publish the result, the final result of a bid is displayed. In bid extension, farmers or traders may extend bid due to several reasons like a technical failure in bidding platform or farmer is not happy with the price. In exit bid, the farmer may exit the bidding process. Once a trader wins the bid, he/she can deny the final bid price to the farmer. The objective of weighment is to know the net movement of commodity entered and exited through the gate of *mandi*. APMC has to keep track and see that there is no imbalance in net inflow and outflow quantities of any commodity.

5. **Sale agreement and settlement**: Once the final bid is made and weighment is done, a sale agreement is made. The sale agreement usually consists of the commission charges, market cess and *hamali* (labour) charges. For settlement, all the stakeholders need to have a bank account which has to be registered with e-NAM.

5   Findings

The *Jetalpur mandi* provided a glimpse of the implementation of e-NAM in Gujarat. However, some important observations were made during the study. It is evident in the literature that most of the ICT initiatives with respect to the empowerment of rural citizens have a low success rate [6]. Innovation is an idea, behaviour or object that is perceived to be new by its audience [10]. e-NAM is a new IT-based initiative which aims to empower farmers by providing a platform where they could sell their produce at a competent price. The authors view e-NAM as an IT artefact. The decision to adopt or reject any new technology is affected by five attributes, namely observability, relative advantage, compatibility, trialability and complexity [11]. Observability, relative advantage, compatibility and trialability show a positive correlation with adoption, while complexity can be found to show an inverse relationship.

5.1   Observability

Observability is the way people see the benefits or results of an innovation. In theory, e-NAM proposes various benefits to its stakeholders. Few farmers and traders opine that bidding on e-NAM takes more time than the traditional bidding process. The time taken for each e-auction is 20–25 min which is more than normal auctioning (which takes maximum of 5 min). Traders believe that current e-NAM platform will not be suitable and useful for trading during peak time when 600–700 paddy tractors come every day for trading. As the project is in its initial phase of life cycle, the stakeholders, i.e. traders, farmers and APMC officials, are not able to verify the benefits of e-NAM. Its only functioning aspect at the *Jetalpur mandi,* i.e. computerized gate pass, will lead to huge queue of vehicles during peak time. Traders do not trust the tradable quality parameters as specified by e-NAM. They have their

own quality checking techniques which are less time-consuming. Further, traders perceive that quality checks by e-NAM facility may not even reflect the true quality. In normal auction, they can see the commodity as a whole. But, in sampling, they will only get to know about a small sample.

5.2 Relative Advantage

Relative advantage is the added benefit, which an adopter perceives over the old practice. Theoretically, the e-NAM project has many advantages over the traditional way. However, most stakeholders find the added advantage of online transaction painful. For example, in auctioning, it is necessary for all the stakeholders to have bank accounts. However, most farmers do not have bank accounts. Most farmers are small farmers with less produce for trading. They prefer cash transactions over cheques. During our research, one farmer shared his concern, '*I want cash when I sell my produce. How will I verify if trader has put the required amount in my bank account*'? Interestingly, another farmer said '*If money is transferred to bank then I have to withdraw from the bank. For small transactions cash is better. I don't want to run to banks for such sum of money. It costs us a day and money to visit bank also*'. Many farmers do not have bank accounts and they do not want to have them. Some have bank account but they use it rarely. During discussion, traders were found reluctant to share their bank details.

5.3 Compatibility

Compatibility is the extent to which any new technology complies with the present social norms and beliefs, past experiences, existing ideas and needs of adopters. Compatibility is one of the key facilitating conditions for the adoption of technology artefacts [3]. e-NAM seems to be incompatible within the social context. First, it entails the use of mobile devices, tablets, computer systems for trading. Almost, all farmers and traders in the study were not savvy in using such electronic gadgets. In addition, use of English as a language in the application adds to the woes. It is observed in the literature (e.g. [15]) that lack of digital skills, access to the Internet, lack of digital experience, language, etc., may lead to 'digital divide'. Those people who are proficient in using digital technology will benefit the most from e-NAM. e-NAM promotes cashless transaction, and therefore, it will be a formidable challenge to have bank accounts opened for all the farmers interested in trading. A farmer said '*I don't have necessary papers to open a bank account*'. Farmers and traders were also found to be apprehensive of sharing their personal details such as bank account, Permanent Account Number (PAN) and Aadhaar (it is a twelve-digit unique identity number based on biometric and demographic data) (in case they have) for trading purpose.

5.4   Trialability

Trialability is the extent to which a technology may be tested or experienced with on a limited basis [12]. The trialability of e-NAM is not evident in the data. More or less, it is compulsory for the farmers to use computerized gate pass. However, the farmers were found to be sceptical of the project until they find the real difference between the traditional trading and electronic trading. Digital skills related to finding and assessing information are crucial for using such electronic platform [14]. Trialability will provide the stakeholders to learn more about the services. In addition, they would be in position to know about the digital skills from their peers who have digital skills. Farmers can tap into and benefit from the experiential knowledge of fellow farmers and experts in the farming community [8].

5.5   Complexity

Complexity is about ease in using an innovation. Given the social context of farmers, the complexity of the process flow at e-NAM and digital skills of users, the stakeholders will find it difficult to use e-NAM services. The use also becomes difficult due to the lack of standardization of measure in the electronic platform. Farmers are not used to the metric system of measurement. They are more comfortable with *Adha* (half kg), *Sava* (1.250 kg), *Paseri* (5 kg), *Daseri* (10 kg), etc., as units of measurement. However, in the e-NAM system, the price of a commodity is given for 20 kg. Such differences bring in not only complexity but also incompatibility with the existing social belief and norms. The complexity of the e-NAM system increases with IT infrastructure-related challenges like lack of the Internet/server connectivity, electricity, lack of computers, human resource during peak trading seasons.

6   Discussion and Conclusion

e-NAM is a unique project for farmers, and it has the prospect of providing economic benefits to farmers by connecting them to *mandis* across the country in future. However, as discussed in the earlier sections, a lot of work is to be done at the behavioural, strategic and implementation levels. Training programmes and workshops should be conducted for farmers and traders to build awareness and trust towards the services. Also, bottlenecks with respect to the IT infrastructure, digital illiteracy, standardization of measurement, quality checks, etc., have to be taken into consideration for successful implementation. Project officials should continuously drive efforts towards creating an environment where all stakeholders trust each other and have positive attitude towards the project. Authors concur with Potnis [9] that mobile phones can be efficiently used for trading as they have relatively low learning curve, affordability

and ease of availability. Employees of *mandi* also need appropriate training as well as positive attitude for digital drive. In addition, use of different models to reduce time in processing of tasks could also be considered. For example, project officials may explore the possibility of linking e-NAM portal with Aadhaar system to reduce time taken for making gate pass at *mandis.*

References

1. Acharya SS (2004) Agricultural marketing in India, vol 17. Millennium Study of Indian Farmers, Government of India, Academic Foundation, New Delhi
2. Chand R (2012) Development policies and agricultural markets. Econ Polit Wkly 47(52):53
3. Chengalur-Smith I, Potnis DD, Mishra G (2016, January) The adoption of IBM's spoken web in information poor communities: a pilot study with farmers in Gujarat, India. In: 2016 49th Hawaii international conference on system sciences (HICSS), IEEE, pp 3878–3887
4. Dwivedy N (2011) Challenges faced by the agriculture sector in developing countries with special reference to India. Int J Rural Stud 18(2)
5. Kumar G, Gulati A, Cummings Jr A (2007) Foodgrains policy and management in India, responding to today's challenges and opportunities. International Food Policy Research Institute, New Delhi and Indira Gandhi Institute of Development Research, Mumbai
6. Madon S (2009) e-Governance for development. In: e-Governance for development. Palgrave Macmillan, UK, pp 53–70
7. Parikh KS (2012) Development policies and agricultural markets. Econ Polit Wkly 47(52):53
8. Patel N, Shah K, Savani K, Klemmer SR, Dave P, Parikh TS (2012, March) Power to the peers: authority of source effects for a voice-based agricultural information service in rural India. In: Proceedings of the fifth international conference on information and communication technologies and development, ACM, pp 169–178
9. Potnis DD (2011) Cell-phone-enabled empowerment of woman earning less than $1/day. IEEE Technol Soc 30(2):39–45
10. Robinson L (2009) A summary of diffusion of innovations. In: Enabling change
11. Rogers EM (1995) Lessons for guidelines from the diffusion of innovations. Jt Comm J Qual Improv 21(7):324–328
12. Rogers EM (2003) Elements of diffusion. In: Diffusion of innovations, 5th edn, pp 1–38
13. Sachan A, Sahay BS, Sharma D (2005) Developing Indian grain supply chain cost model: a system dynamics approach. Int J Prod Perform Manag 54(3):187–205
14. Van Dijk J (2005) The deepening divide: inequality in the information society. Sage, Thousand Oaks
15. Van Dijk J, Hacker K (2003) The digital divide as a complex and dynamic phenomenon. Inf Soc 19(4):315–326
16. Vijayshankar PS, Krishnamurthy M (2012) Understanding agricultural commodity markets. Econ Polit Wkly 47(52):35
17. Wani SP, Bergvinson D, Raju KV, Gaur PM, Varshney RK (2016) Mission India for transforming agriculture (MITrA). Research report IDC-4