

Effective Utilization of Technology for Discovery of Equilibrium Prices: Forward Auctions of NCDFI eMarket

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Abstract—While *technology* can help any organization in a number of ways, effective utilization of *technology* increases the return on investment. This paper considers one such case where the technology is used for protecting the interest of dairy farmers and buyers by discovering the Equilibrium Prices. This paper discusses methodology for Forward Auctions adopted by NCDFI, an apex cooperative dairy, for its eMarket operations. Results of an empirical test that demonstrates the relevance of the adopted model and merits of the system also discussed in this paper. At the end, the paper also discusses future research and application areas.

Index Terms—Bulk Marketing, Equilibrium Price, eMarket, Forward Auction

I. INTRODUCTION

Dairying is the most stable economic activity for the rural people in India. It has enormous scope for rural development and national prosperity. One of the main reason for success of cooperative dairying is creation of institutional infrastructure from village to national level which is directly owned by farmers. Farmers at village level forms a village society which is responsible for milk collection and provides input services to the member farmers. The milk collected is processed at district level cooperatives. State level marketing federations help these plants in marketing their produce. At national level, National Cooperative Dairy Federation of India Ltd (NCDFI) provides policy support and also helps the cooperatives in marketing their produce through NCDFI eMarket and through negotiations with Institutions such as Ministry of Defence. Total number of farmers associated with dairy cooperatives are 163 lakh covering 1.77 lakh village societies [1].

Adoption of technology and its application to ensure better returns to dairy cooperatives and in turn to milk producers has been the focus of NCDFI. One such initiative is NCDFI eMarket, an online marketplace for trading of all products that are being handled by the dairy industry. Total transacted business at NCDFI eMarket during the financial year 2018-19 was Rs.1,010 crores [2].

A. Bulk Marketing by Dairies

Technology is extensively utilized in dairy sector for production and day to day operations. However, marketing

decisions are unstructured in nature and required human like processing and decision making which is not possible for typical pre-defined transaction processing system. Hence, traditionally, cooperatives market their bulk produce through manual systems or through tenders. Though cooperatives spend much on publicity by placing advertisements in newspapers, the information is not reaching the targeted buyers which results in less participation. Further, there is a risk for formation of cartels. Many dairy cooperatives are fixing their sale prices based on the recommendation of committees formed for this purpose. Limited or dated market price information complicates the decision making thereby resulting fixation of prices below the equilibrium prices.

Marketing procedures and challenges in the dairy business were discussed by many [3], [4], [5], [6]. Some of the challenges in the dairy bulk marketing are as follows.

- Reach to various stake holders simultaneously;
- Ability to provide a global as well as transparent platform;
- Volatility of the prices;
- Adherence to the Central Vigilance Commission guidelines;
- Concluding the contracts within a short span;
- Refunding the Earnest Money Deposits in time;
- Security and creating as well as managing domain institutional knowledge repository for future use.

By adopting modern information and technological advancements along with a novel model of forward auction, many of the aforementioned challenges can be addressed. NCDFI eMarket is a portal with more than 1,000 members spread across the country. It conducts eAuctions for bulk sale of dairy products which are manufactured by its member cooperatives. While NCDFI eMarket adopts different auction methods for various commodities, this paper discusses about 'Forward Auctions', which is mainly used for bulk sale of dairy commodities.

The paper is structured as follows: Section 2 provides a brief review of Forward Auctions and the methodology adopted by the NCDFI eMarket. Section 3 presents the results of an empirical test that demonstrates the relevance of the adopted model. Section 4 discusses the merits of the system while Section 5 concludes by discussing the limitation and future application areas.

II. METHODOLOGY OF FORWARD AUCTION

Forward auction is defined as an electronic auction, which can be used for selling commodities to many potential buyers simultaneously. In the Forward Auctions of NCDFI eMarket, prior to a trading event, each seller announces the products to be sold and their specifications along with minimum and maximum supply quantities and base prices. Trading event is presently being held on each Wednesday at 1400 hours simultaneously for all sellers. Bidders need to deposit required Earnest Money Deposit to participate in the auctions.

The law of supply and demand, one of the fundamental concept of Economics is adopted here. The price increases round by round only if demand exceeds supply and eventually trades conclude at equilibrium prices. An illustration is shown at Fig. 1.

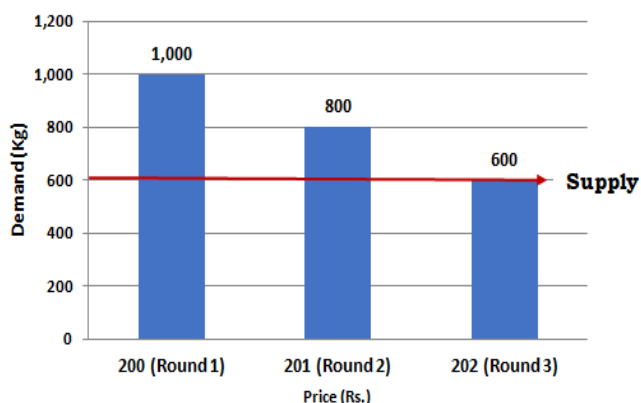


Fig.1 Discovery of Equilibrium Price

As illustrated in Fig. 1, the seller offers 600 Kg of product @ Rs.200 per kg. In Round 1, the demand was for 1,000 Kg and when the rate gradually increases, the demand gradually reduces. At Round 3, the demand and supply is matching and hence the trades are concluded with per Kg clearing price of Rs.202 as compared to the base price of Rs.200.

Maximum number of rounds in an auction are pre-defined as 10. While first round will have 30 minutes time, subsequent rounds will be of 15 minutes each. There is a gap of 5 minutes between each round. System increases the prices by round by round and there are no manual interventions. If the demand is less than 2 times, the price will increase by 0.5% and if the demand is 2 to 3 times, then the price will increase by 1.0%. The maximum increase between any rounds would be 2.5% provided the demand is equal or more than 5 times.

While participating in the auctions, the bidders need to enter the quantities only while system will display the price. Bidders have to join from Round 1 and in subsequent rounds when the price increases, the bidders will have choice to maintain or reduce the bid volumes.

In the example shown at Fig. 1, assuming that the demand at Round 3 is 500 Kg i.e. less than the offered quantity of 600 Kg, the contracts will be concluded with Round 2 prices. In such a scenario, first preference for the allocation would be given to the participants in Round 3 and if any quantity remains, the same will be allocated to the highest bidder of Round 2. In this auction type, there will be multiple buyers for each auction and all the trades will be concluded with same prices.

While offering the product, the seller also need to provide the minimum quantity to be sold and the demand is less than the given quantity the auction will fail. In such a case, the seller has an option to float a new auction with reduced price.

III. COMPARATIVE ANALYSIS

A study of sales data of NCDFI eMarket for April to June 2019 was carried out. Bulk products prices are volatile in nature. Hence, the sellers fix the prices based on Market Intelligence which may not be accurate every time. In such a case, there is a need to protect the interest of farmer organizations. Table 1 shows the instances where the prices are increased round by round thereby generating additional revenues to the member cooperatives of NCDFI.

Table 1 Additional revenues generated by NCDFI eMarket

Seller	Product	Auction Date	Qty (MT)	Offered Price (Rs/Kg)	Traded Price (Rs/Kg)	Additional Revenue (Rs)
Nandini	SMP	3-Apr-19	300	175	186	33,00,000
	SMP	10-Apr-19	100	186	190	4,00,000
	SMP	18-Apr-19	100	200	206	6,00,000
			300	200	209	27,00,000
	SMP	15-May-19	100	200	210	10,00,000
			200	225	231	12,00,000
	Butter		100	270	275	5,00,000
	SMP	22-May-19	400	231	235	16,00,000
		29-May-19	300	235	237	6,00,000
	Butter	19-Jun-19	50	295	299	2,00,000
Devbhog	Butter	15-May-19	25	259	260	25,000
Gokul	SMP	3-Apr-19	100	195	199	4,00,000
	SMP	18-Apr-19	100	205	208	3,00,000
	Butter	19-Jun-19	100	295	296	1,00,000
Mahanand	Butter	19-Jun-19	100	295	296	1,00,000
		19-Jun-19				
		19-Jun-19				
Total						1,30,25,000

As shown in Table 1, total additional revenue generated by NCDFI eMarket during Apr-Jun'19 was Rs.1.30 crores. Had the sellers opted for manual systems, they would have ended up getting the original prices fixed by them thereby losing an amount of Rs.1.30 crores. In the traditional systems, after fixing the price, the cooperatives sell the produce on first come first serve basis without realising the potential prices. However, in this case, since all the buyers and sellers are brought to the same platform, the system concludes the trades with equilibrium prices on real time basis.

IV. MERITS OF THE SYSTEM

The NCDFI eMarket provides multiple benefits to both buyers and sellers such as secure and transparent procedures, real time allocation of quantities, global reach, conclusion of contracts within a short time, adherence to CVC guidelines, discovery of fair market prices, wider publicity, quick

deliveries, real time refunds of earnest money deposits, creation of institutional repository, etc.

Bringing all the sellers at same platform at same time provides multiple choices for the buyers. Further, since the buyers located across the country are directly buying the required material from the sellers, role of intermediators reduced to great extent benefitting both sellers and end users.

Considering the volatility of the prices, concluding the contracts in a short span of time is necessary. However, in case of tenders, the short listed buyers would be called for negotiations. It is observed that minimum 15 days time is required for conclusion of tenders while the conclusion of trades at NCDFI eMarket are on real time basis.

In a survey of 4,800 marketers conducted in the year 2019, 93% of marketers indicated that their social media efforts have generated more exposure for their businesses [7]. Accordingly, apart from using social media actively for circulation of auction news, NCDFI eMarket developed Android based mobile application which provides information on customized basis to all. These efforts helped in reaching targeted customers on real time basis.

V. CONCLUSION

The limitation of the system is whenever the seller quotes higher prices, the auction fails and there is no provision to know at what rate buyers are interested to purchase the product. As the auctions are conducted on weekly basis, the seller need to wait for next auction to quote reduced prices. This issue need to be addressed.

As discussed, NCDFI eMarket has many advantages as compared to traditional systems. This technology helped the cooperatives to generate more revenues which in turn helped them to provide better returns to the dairy farmers. This system can be adopted by cooperative sugar industry as well as other industry for their bulk commodities.

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