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Supply Chain Management of Tomato Production at Madanapalle region: A Case Study

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Abstract— Active players/ stakeholders in the entire supply chain of tomato production at Madanapalle region starting from the seed manufacturer to the buyers in the market were identified. A survey was conducted in 34 sampled villages with 690 small/medium business farmers who were interviewed with the purpose of learning about the cost of tomato production and also with regard to the satisfaction levels of the services provided by various stakeholders in the supply chain.
Interviews with all the remaining players/stakeholders in the supply chain were conducted through an unstructured questionnaire. During the study each player's revenue and risks were noted and observed in the context of the farmer and urban end user getting most affected due to market pricing. A new pricing model has been proposed that will help in developing a rural-urban linkage.

Keywords-Supply chain, Stakeholders, Pricing,, Risk

1.0 INTRODUCTION

A supply chain includes more than one company in a series of supplier–customer relationships. A supply chain in the context of agri-products, particularly related to the tomato, would embrace all activities starting from seed suppliers to the end consumer. Supply chain management is the act of optimising all activities throughout the supply chain, so that products are supplied in the right quantity, right quality, to the right location, at the right time, and at optimal cost. Supply chain management and the closely related concept of logistics are cornerstones of competitive strategy, increased market share, and shareholder value for most organisations. Logistics is a critical part of the supply chain. The co-ordination and, perhaps, integration of the logistics systems of all the organisations in the supply chain are necessary requirements for successful management of the supply chain. Yet the logistics area, in a large number of such organisations, is managed by people who did not have the opportunity to gain professional competencies in managing/integrating it [ref. [1], [2], and [3].

Having recognised the importance of logistics in the supply chain area, many organisations aim to improve their logistics' functional area. Another factor contributing to the recognition of logistics is increased customer sensitivity to not only product quality but also to the associated price. The responsibility of the logistics manager includes a number of activities. The number and importance of these activities to the business varies according to the particular emphasis placed on the logistics' function. Traffic and Transportation involves the physical movement or flow of raw materials or finished goods and involves the transportation agencies that provide service to the firm. Customer Service levels play an important part in logistics by ensuring that the customer gets the right product, at the right time and place. Logistics' decisions about product availability and right price are critical to customer service. Supply chain modeling must be fact- based. Independent participants can assert facts and avoid "taking sides" that may be risky for employees. The objective is not to build a model. The objective is to model the sensitivity of one variable against others.

1.1 BACKGROUND

Madanapalle is a town located in the Chittoor district of Andhra Pradesh. It is one of the biggest Revenue Divisions in India (covering almost half the Chittoor district). It is a fast-growing city at the centre of an agricultural region noted for its fruits and vegetables, especially tomatoes. A centre of vernacular culture, Madanapalle has pleasantly mild to warm summers with average to high temperatures ranging between 30 and 35 degrees Celsius (86 F to 95 F). Temperatures do not exceed 40 degrees Celsius (104 F) and winters are cold with temperatures between 7 and 15 degrees Celsius (44.6 F to 59 F). The summer months usually last from March to June. This climate is ideal for tomato growing. One can find 125 or more villages in and around Madanapalle with tomato-growing farmers. Madanapalle comprises a vast tomato market that incorporating the sales and marketing of tomatoes alone.

Four to seven hundred tons of tomatoes are sold at this market per day depending on peak and non-peak seasons. Local demand is at about 35,000 to 40,000 kilograms' tomatoes per day. Pricing at this market is a primary issue in this study. Over the recent past there has been a significant growth in the number of nursery players. All the players/stakeholders in the supply chain have been studied with respect to their revenues and risks.

2.0 Objective

The existing system of operations at the production and market levels has been in place over a period of time. The objective of this study is to explore possibilities of improvement for the same. From an operations' research perspective, the objectives include achieving optimisation in terms of benefits to all stakeholders in the supply chain.

3.0 Methodology

The existing upstream and downstream flow operations have been studied to obtain a representative picture of the system. To arrive at total costs up to the yield of the agri- product, namely the tomato, farmers' surveys have been conducted at 34 sampled villages out of 125 tomato-growing villages. Accordingly, around 690 farmers were interviewed with a structured questionnaire with the aim of learning about the cost of tomato production and to gauge the satisfaction level of the services provided by various stakeholders in the supply chain. Mostly small or medium level farmers were interviewed. Interviews with all the remaining players/stakeholders in the supply chain were conducted through an unstructured questionnaire. Pricing being the most challenging issue, a new pricing method was developed in order to balance the satisfaction levels of stakeholders involved at market level. For model testing, primary data constituting the buyers' maximum quoted price before auctioning and the sellers' minimum expected price was collected.

3.1 Players/stakeholders in the supply chain

Figure 1 show the players/stakeholders involved in the supply chain. Each player has been studied in detail.

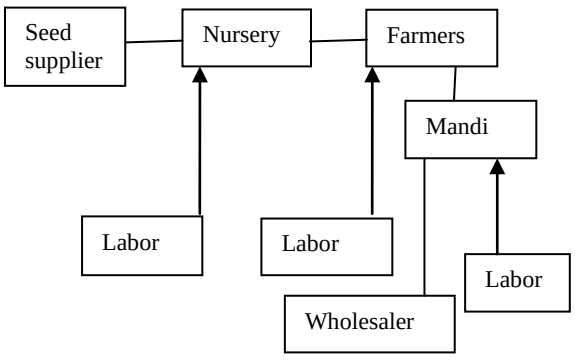

Figure 1

Generally speaking, the relationship between the nursery owner and farmer is very cooperative. The number of nursery owners growing at a rapid pace will help the sector to become competitive.

3.11 Seed suppliers

In this section are considered both seeds' suppliers as well as seeds' manufacturers. In the seeds' manufacturing unit, inputs are supplied by farmers under the guidance of the seeds' manufacturing unit manager. The payment is done in three phases. The seeds' wholesaler procures the seeds from various manufacturing units under different brands with different variety numbers. In the past, farmers would dry the tomato seeds and use them for growing. With the advent of seed culture they then started to buy dry packets of tomato seeds which they used to plant till 2000 – 2001. The trend changed after 2001. Plants or saplings are now developed in the nurseries from the dry seeds and farmers buy the saplings from nurseries. So, the farmers now depend on sapling developers instead of seed sellers. Before 2001 the seeds seller's customers were farmers but today nursery owners have taken over the role of customers. In the Madanapalle region the sales of tomato seeds amounts to three to four tons per month. Seed sellers export seeds too. The risks include situations that affect the yield. Other than natural calamities farmers today blame the seed sellers for poor yields citing "duplicate seeds" being sold from the previous year. Disease-infected plants develop once every two - three years; the seed companies then make the necessary changes.

3.12 Nursery owners

Madanapalle has seen a tremendous increase in the number of nursery owners in the recent past due to good profit in the business. The customers are, of course, farmers. For customers outside the Madanapalle region nursery owners deliver the seedlings on order between the third and fourth week whereas local farmers can collect them personally provided the right variety is available. The average nursery owner's sales' is to the tune of 3,000 seedlings per month with sales' revenue at Rs. 45, 000 per month which is quite a good amount. The risk is when the seedlings are sold between the 17th and 25th day of sowing the seeds. For outside farmers the risk amounts to zero as they deliver by order. For local farmers, on the other hand, the right kind of variety may not be available sometimes. It being difficult to identify the variety of tomatoes some unscrupulous nursery owners, taking advantage of this situation, sell the wrong variety to farmers. Conversely, some loyal nursery owners not only supply the correct seedlings to farmers but also guide them with the right

variety of seedlings and the right usage of pesticide. They also try and guide the farmers towards minimising their investment. This is essential since low yield increases the cost of production and the farmer may shift to another nursery owner. Sometimes local farmers take seedlings on debt as they do not have the money. Loyal nursery owners do not exploit the farmers and give them the produce in exchange.

3.13 Farmers

Farmers plant 10,000 seedlings per acre that are purchased from nursery owners. The total yield per acre varies from 6125 to 11375 kilograms (kgs). Yield varies in consonance with season, inputs, and seed variety. The average cost of production from the farmer's survey is approximately 2.95 per kg. Revenues accruing to farmers vary from very high to very low starting from a loss like 2.00 to 18.00 per kg. This variation is dependent on seasonal demand. If a particular variety leads to low yield the government tends to compensate some percentage of the amount in the cost of production. Recently, however, the famers have not been getting compensation since the seedlings have been purchased from nursery owners operating without licenses. As a matter of fact, the government has not given licenses to any nursery owner. So, the risk factor involves getting yields at production level and getting the right price at market level.

3.14 Market/Mandi Agents

Market agents play an important role in mediating between sellers and buyers. During the mediating process, it has been observed that buyers reap greater benefits compared to the sellers in the existing system. This is the reason prices at the market level undergo such high fluctuations. In the existing system, auctioning is followed during marketing procedures. Marketing agents also help in giving loans to sellers/ farmers whenever necessary. Every seller is attached to only one marketing agent whereas buyers tend to buy from more than one agent. According to government regulations, market agents should take maximum 4% commission from any player including sellers or buyers, yet they continue to charge 10% commission from the sellers. Risks for these marketing agents involve satisfying both buyers as well as sellers. On any given day marketing agents have to balance the price to satisfy both buyers as well as sellers which is a challenging task. In general, buyers and sellers tend to be non cooperative while the marketing agents have to play a cooperative role with both buyers and sellers. In reality, cooperation on the part of buyers is greater compared to sellers with respect to marketing agents. It has been observed that auctioning marketing procedures seem artificial with some buyers sensing that marketing agents are biased towards a few buyers. There is good enough motivation for developing a pricing model that will be beneficial to all stakeholders apart from being transparent. More details about the proposed pricing model will be discussed in section 4.0.

3.15 Buyers

Buyers in these markets are mostly representatives of various urban stakeholders. Some buyers come directly to the market from outside the Madanapalle region without representatives on their own vehicles. These buyers participate in the auctioning system and arrange for the transport of their goods to respective destinations. Buyers usually choose a one-way transport system using mostly an effective cost minimisation approach by searching for vehicles which are coming from different places and going to the desired destination(via Madanapalle) with some space available for taking the tomatoes. Buyers who represent urban stakeholders bear the transportation cost and tend to buy following competitive pricing in accordance with the urban prices. During the auctioning period these buyer representatives consult with the respective urban buyers. There is a risk involved in maintaining relationships with both marketing agents and urban buyers.

3.16 Transport providers

Transport providers exist both upstream and downstream. Transport vehicles in the upstream area visit various villages with empty crates from the market bringing back tomato-filled crates to the market. These crates are owned by marketing agents who charge Rs. 6 per crate to the farmer and adjust it during the selling transaction process. The transport operators charge between Rs. 10 and Rs. 15 per crate from farmers for transporting their tomato crates from their village to the market. The transport operators operate thrice daily usually and for each trip they carry up to 100 crates. Variations in charges occur depending on the distance from the market. The risk involved here is timely delivery. Transport vehicles in the downstream area ply from the market to various urban markets through buyer representatives. For doing this, the transport provider tries to search for vehicles that go vacant towards urban destinations. Transport providers try to maintain a good network with many other transport providers who deal with other commodities. In this stream, the transport vehicles deal with capacities of up to 600 crates. These vehicles charge between Rs. 10,000 and Rs. 20,000 depending on the distance. Besides the stakeholders that have been mentioned above, there exist many other stakeholders via Government offices including agricultural/horticultural, marketing officials, and tomato processing unit owners.

3.2 Supply chain integration

Supply chain integration is essential for all the stakeholders so that they can adopt a co-operative approach and aim for systemic optimisation in terms of benefits rather than individual benefit maximisation. The government being

an important stakeholder, it has to either delete the nursery owner or give them license through a supply chain management approach. This should be done in phases through performance.

Those nursery owners who receive good feedback from the farmers should be given licenses while the rest should be given a chance to improve their performance. Those who are unable to do so should be discarded. Once regulation from the government imposed, seeds supplier should follow a co-operative approach like selling seeds to only licensed nursery owners.

From the survey of farmers, the following table shows the satisfaction levels of various stakeholders. From table 1 it may be observed that transport operators have the highest satisfaction level mean compared to that of other stakeholders. Next in line are the nursery owners while the ones with least satisfaction are the agricultural extension officers (AEO). These satisfaction levels indicate that all these stakeholders should adapt a co-operative approach in order to get systemic benefit.

End consumers at urban places often observe fluctuations in tomato prices. Urban market agents fix prices according to supply. In some urban places marketing agents prefer local suppliers so that local suppliers get maximum benefit. Also, a regional conflict within the public leads to local suppliers being preferred. This serves to increase tomato prices in those urban places.

Market agents along with the buyers and sellers should adapt the following proposed pricing model to get a systemic benefit.

4.0 Tomato pricing model

Market commissioning agents

Let us denote market commissioning agents as MCA_i

(i = 1,2,3,--,l)

Table 1

	N	Minimum	Maximum	Mean	Std. Deviation
SL of Seedling seller	688	.00	5.00	2.8183	1.14856
SL of AEO	688	.00	5.00	1.8663	.94668
SL of Prices at market	688	.00	5.00	2.1061	.95400
SL of Maketing procedures	687	.00	5.00	2.4119	1.03751
SL of Mandi agent	688	.00	5.00	2.4898	1.19187
SL of Transport operator	688	.00	5.00	3.2137	1.03897
Valid N (listwise)	687				

Farmers/sellers

Sellers may be identified as Sij where i denotes the ith mandi agent and j denotes the jth farmer attached to the respective mandi commissioning agent. Here j = 1, 2, 3, ---, mi

Buyers

Buyers may be defined by Bijk in which the first subscript indicates the market commissioning agent, the second subscript indicates the respective seller/farmer, and the third subscript indicates the buyer. The following pricing model is based on the matching game approach [4].

Several farmers/sellers are likely to be attached to each market commissioning agent but each farmer will be attached to only one market commissioning agent. Buyers are free to buy from any farmer/s and also from any market commissioning agent/s. Under the existing system the market commissioning agent facilitates auctioning at the market. Before the beginning of the auction, buyers can look at micro level at the quality of tomatoes by overturning one, two or three crates of tomatoes and this number will depend upon the number of crates of tomatoes available for sale. Usually women labourers are hired by farmers for grading. After the completion of this process labeling (coding) is done by writing on a piece of paper the name of the farmer and the number of crates available for sale. Many farmers have expressed the feeling that auctioning at the mandi seems to be biased mostly towards buyers. Hence the following system has been proposed:

Each market agent should invite farmers/sellers to enter data regarding quoting the minimum price/crate for which they can sell over a computer along with the number of crates available for sale. All farmers should enter their data independently which even market agents cannot access. The process of data entry by farmers/sellers should go parallel across market agents. It should be borne in mind, however, that buyers may be common to different market agents. After looking at the quality of tomatoes of every farmer across all market agents, buyers should enter the data of maximum price/crate for which they can buy. Fractional lots will not be allowed to buy. Once the data entry is over the buyer should reconfirm the quoted price. After reconfirmation, one cannot change but one is able to withdraw from the competition of buyers. Actual buyers will be selected through the computer by computing the maximum difference between the seller and buyer. The allocation for each stakeholder, namely seller/farmer,

market commissioning agent, and buyer will be calculated as follows:

Stakes for sellers S_{ij} =

$$[0.96 * Max\{MxP_{ijk}, k = 1,2,3,--\}$$
$$if\ \ Max\{MxP_{ijk}, k = 1,2,3,--\} < MnP_{ij}$$
$$Otherwise$$
$$MnP_{ij}\ \ if\ 1.04 * MnP_{ij} =$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\}$$
$$MnP_{ij} + (0.96 * Max\{MxP_{ijk},$$
$$k = 1,2,3,---\}$$
$$-1.04 * MnP_{ij}) / 3$$
$$if\ 1.04 * MnP_{ij} < 0.96 *$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\}$$
$$MnP_{ij} - (1.04 * MnP_{ij} - 0.96 *$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\} / 2$$
$$if\ 1.04 * MnP_{ij} > 0.96 *$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\}]$$

Cost of purchase for buyers B_{ijk} =

$$Max\{MxP_{ijk}, k = 1,2,3,---\} - 1.04 * MnP_{ij}) / 3$$
$$if\ 1.04 * MnP_{ij} < 0.96 * Max$$
$$\{MxP_{ijk}, k = 1,2,3,---\}$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\} +$$
$$(1.04 * MnP_{ij} - 0.96 *$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\} / 2$$
$$if\ 1.04 * MnP_{ij} > 0.96 *$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\}]$$
$$[1.04 * Max\{MxP_{ijk}, k = 1,2,3,--\}$$
$$if\ \ Max\{MxP_{ijk}, k = 1,2,3,--\} < MnP_{ij}$$
$$Otherwise$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\}$$
$$if\ 1.04 * MnP_{ij} = 0.96 * Max\{MxP_{ijk},$$
$$k = 1,2,3,---\}$$
$$Max\{MxP_{ijk}, k = 1,2,3,---\} - (0.96 *$$

Stakes for Mandi commissioning agents MCA_i

$$[0.08 * Max\{MxP_{ijk}, k = 1,2,3,--\}$$
$$if\ \ Max\{MxP_{ijk}, k = 1,2,3,--\} < MnP_{ij}$$
$$Otherwise$$
$$0.04 * MnP_{ij} + 0.04 * Max\{MxP_{ijk}, k = 1,2,3,---\}$$
$$if\ 1.04 * MnP_{ij} > 0.96 * Max\{MxP_{ijk}, k = 1,2,3,---\}$$
$$0.04 * MnP_{ij} + 0.04 * Max\{MxP_{ijk}, k = 1,2,3,---\} +$$
$$(0.96 * Max\{MxP_{ijk}, k = 1,2,3,---\} - 1.04 * MnP_{ij}) / 3$$
$$if\ 1.04 * MnP_{ij} \le 0.96 * Max\{MxP_{ijk}, k = 1,2,3,---\}$$

If two or more buyers quoted the maximum price which happens to be optimum then a quick auction may be held only for those buyers. In such cases the agent gets only 4% commission from each of those buyers and sellers/farmers. This ensures that the market agents do not try to leak the data. All the farmers are able to enter their data and get quotations on competitive prices that they can verify from other markets with the help of their mobile phones.

Under the proposed system, we observe that the stakes of both market commissioning agents and farmers is a win-win situation compared to the existing system. For buyers too this can be a winning situation since more price if it is quoted then chances of getting the right kind/quality of tomatoes will be high and at the same time differential reduction in price will occur which leads to a winning situation. Table 2 helps analyse the comparison between the existing and proposed methods of pricing.

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In the proposed system, we observe that the stakes of both market commissioning agents and farmers will be a win-win situation when compared to the existing system. For buyers too we can consider it as wining situation since more price if it is quoted then chances of getting the right kind/quality of tomatoes will be high and at the same time differential reduction in price will occur which leads to a winning situation. To compare the existing and proposed methods of pricing, the table 2 will help in analysis

Table 2

Sellers / Farmers stake	Buyer stake	Commission Agents Stake	Explanation
0	1	1	Seller's are at loss and buyer and commission agents are gaining
1	0	1	Seller's and commission agents are gaining while buyers are at loss
1	1	0	Seller's and buyers are gaining while commission agents are getting less commission
1	0	0	Sellers are benefited and buyer's and commission agents are at loss
0	1	0	Buyer's are gaining and sellers and commission agents are at loss
0	0	1	Commission agents are gaining while sellers and buyers are at loss
1	1	1	All the agents are benefited through the use of the model
0	0	0	All that agents stakes are at loss through the use of the model

The proposed pricing model explains different combinations that test the model keeping the actual situation as the base and it also calculates which agent's stakes are benefited by the model. We can see in table-2, "1" representing the agents' stake benefitting through the use of the proposed model and "0" representing loss. There are 8 different situations that could occur while using the model as shown in table 3.

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The first combination "1, 1, 1" is one in which the model is an exact replica of the current procedure followed by the market in which the farmer's quoted price, the auctioning price, and the market agent's stake is similar to that of the actual market.

The second combination is (1, 0, 1) one in which the buyer has to pay more than what he would be actually paying in the market. In this situation the buyer who had quoted in the beginning of the auctioning does not get the chance to buy but another buyer is able to purchase due to the influence of the marketing agent's artificial auctioning.

The third combination (0, 1, 1) occurs when the farmer's stake gets reduced. The possibility of such an event occurs when the farmer has very little idea about the current market price and ends up quoting a low price based on the cost of production as opposed to the market price leading to low stakes for the farmers.

In the current market it has been observed that the farmer does a good background check by inquiring from different people through phone and many other ways before actually quoting the price. Another point to be considered is that farmers are good sellers with ample experience in respected field. Also, looking at the data collected from around 500 farmers, we have observed that farmers are very good marketers of their products and are capable of pushing their product prices to the maximum by quoting high prices. So the chance of such an event occurring is very low.

The fourth combination "0, 1, and 0" shows market agents and farmers getting lower stakes than warranted by the actual situation with the buyer having to pay a very low price for their purchase. This event would mean that the buyer has quoted lower prices in the model and has quoted more during auctioning. For example suppose a farmer's Mxp was Rs 200 in the model and he actually quoted Mxp as 230 during the auctioning then, in such a case, the auctioning price is higher than the model price. But such a condition is not possible because the model enables a higher number of buyers to freely quote their price as in actual auctions. So the Mxp quoted in the model is equal to the Mxp quoted during actual auctioning.

The fifth combination "0, 0, 1" occurs when both the buyer and seller are at a loss in their stakes while the market agent is benefited. This means that the Mxp is exceptionally high and the Mnp is exceptionally low. This, as seen from the above examples, would not happen if both buyers and sellers were well- informed about the current prices in the market.

The remaining three combinations "0, 0, 0," "1, 1, 0" "1, 0, 0" not being feasible with our model cannot be processed through our model

. Table-3

SELLERS STAKES 1= BENEFIT 0 =LOSS	BUYERS STAKES 1=BENEFIT 0=LOSS	AGENTS COMISSION 1 =BENSFIT 0= LOSS	Total
1	1	1	98
0	0	0	0
1	1	0	0
1	0	1	149
0	1	1	7
1	0	0	0
0	0	1	1
0	1	0	160

Table 3 shows counts supporting the explanations mentioned above for each combination. More precisely, 24% of the total observations derived positive relationships as "1, 1, 1" and all the agents were benefitted through the use of our model compared to the actual market. 36% may be counted as positive outcomes that can be added to the above 24% of observations. It may be concluded, therefore, that the proposed model derives 60% positive outcome from the total observations.

38% observations belong to the "0, 1, 0" model which states that buyers are benefitted whereas marketing agents and seller stakes are at a loss. The reason for such a situation may be attributed to the fact that the farmers actually willing to purchase tomatoes at far higher prices was not promoted by the mandi agents or that the product had a high selling potential which the market agents could not exploit through effective marketing resulting in a greater loss for the farmers. If these 160 would have been participle in our model would result in an overall gain for the total stakeholders.

Thus we can conclude that our model, if used in actual situations, would be more effective and beneficial than the actual mandi that is followed by the farmers.

5.0 Conclusions

Among the various stakeholders in the supply chain, it has been observed that farmers and end urban consumers are the most affected. Farmers' problems may be partially solved using the proposed pricing model at the market. Market agents should also explore opportunities for the participation of more buyers including processing unit owners. Cold storage facilities should be provided in the vicinity of the market so that excess supplies maybe stored and used the next day.

Moreover, by inviting processing unit owners to provide cold storage facilities in the market they could encourage them to store. According to one unit owner, one can store the tomatoes for one month and then process them without losing any properties. This could lead to effective inventory management. In order to improve the satisfaction level of farmers in the context of stakeholders, particularly government departments, nursery owners, and market agents more innovative cooperative approaches need to be put into place. Maximising productivity from the farmers' end is another area of improvement. Government officials, particularly the AEOs, should give services to the farmers efficiently to enable the latter to maximise their benefits.

In the proposed pricing model it has been observed that the system maximises its transparency as well as benefits to all the three players. As farmers are the more important players in the system, this transparency will enable them to improve the supply of tomatoes to the market. This system may be implemented on a trial basis. This system seems to be sustainable. In order to claim the sustainability frequent feedback could be taken from all the three players. Once this proposed system becomes successful then an information system may be developed to enable the buyers from any region to participate in the market without eliminating market agents through local representatives. Sellers/farmers can also access the buyer's demand and take decisions regarding supplying tomatoes accordingly.

On the other end of the spectrum urban consumers' difficulties with regard to high price fluctuations may be resolved if the concerned urban stakeholders can encourage outside suppliers i.e. local rural buyers, to participate in the urban market. Overall costs may be minimised if efficient logistics are put in place by creating a direct urban-rural linkage. This cost minimisation will help solve end consumer difficulties. From the proposed pricing model one may find farmers as consistent estimators in terms of pricing and these farmers may be eligible for establishing direct rural-urban market linkage online by inviting urban buyers to buy from the village itself. There is a large scope of further research in this area of efficient logistical system under urban- rural linkage, particularly in the Madanapalle region. According to retailers of tomato processing products there is an alternative approach for solving end urban consumer difficulties; this has to do with purchasing tomato puree whenever the cost of raw tomatoes per kilogram goes up beyond Rs. 20. Although this product entered the market

two decades ago many urban consumers are not aware of the product and its equation.

[6]

[8]

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