

**IMPACT OF ORGANIZED RETAIL CHAINS ON REVENUE OF
FARMER (A CASE STUDY OF MOTHER DAIRY CENTRE'S IN
HARYANA)**

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Palace:

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Abstract

The objective of the study is to examine the terms and conditions of the procurement contracts of Mother Dairy and Reliance Fresh and also comparing revenue impacts of Mother Dairy and Traditional Marketing Channel on farmer. It is found that the bylaws of the Reliance Fresh is much better than the Mother Dairy procurement contract in terms of price information, quality monitoring, mode of payments etc. The relatively simple contract of Reliance Fresh provides an edge to the Company to attract better quality of the product. However it does not mean that the Mother Dairy does not put up an incentive to grow more and better quality to the farmer. Despite the complexity of the contract of Mother Dairy (MD), it provides a relatively better deal to the farmer as compare to the traditional market chain. This may be the reason that it has been successful for such a long time in many areas. On the practical side of the impacts of MD it is found that except Green Chilli Onion, and Musk Melon the prices of local market are co-integrated with Mother Dairy prices. However, the net revenue of the MD is estimated more volatile than TM for all the vegetables except Bhindi and Tomato. This is quite opposite to the notion that the organized retail chains will stabilize the prices for the farmer and consequent the returns would be stabilized. However, the higher instability of revenue does not mean that it affect farmers income always negatively, rather the effect may be positive if the prices are fluctuating upward. The net revenue of the farmer for selected vegetables is found on an average 17 per cent higher for carrot, 134 per cent for Lauki, 17 per cent for Green Chilli, 45 per cent for Onion, 50 per cent for Bhindi, and 57 percent higher for Musk Melon, in the MD as compare to TM except Cauliflower. Besides, direct revenue impact, there are indirect impact on the revenue of the farmers of the direct procurement of MD. And it is not only confined to those supplying to MD rather extended to all those farmers supplying to the TM. The indirect impact also seems to be considerable given the fact of low derived demand elasticity of the local markets. In short the direct procurement of the MD has enhanced the farmer's revenue.

I INTRODUCTION

Why low growth of area under vegetable and high rate of inflation and perhaps profitability in vegetable coexist? Is it because the price advantages do not accrue to the farmers or producing vegetables is a risky business?

1.2 The widening gap between demand and production of the vegetables has been evident in rising prices of vegetables in recent past. The average increase in the prices of vegetables at wholesale markets was 9.5 per cent during 2006-2010. The contributory factors for this increase have been an increase in demand and sticky supplies. On the demand side, the per capita income of the country is rising and the consumption pattern is getting diversified towards vegetables.

Table: 1. Vegetable Production & Inflation in India

Year	Production (T)	Production Growth (%)	Yield (Tone/hec.)	Area ('000' Hec.)	Area Growth (%)	Yield Growth	Inflation in Vegetable (%)
2006-07	114993	3	15	7581	5	-2	0.5
2007-08	128449	12	16	7848	4	8	19.9
2008-09	129077	0	16	7981	2	-1	3.5
2009-10	133738	4	17	7985	0	4	14.0

Source: National Horticulture Board, and the Office of the Economic Adviser.

1.3 On the supply side the production of vegetables is not keeping the pace with demand. The low growth of the vegetables production during 2008-09 and 2009-10 has been not only because low yield but also because of low growth in the area under vegetables. This indicates that the incentives for the crop diversification perhaps were not sufficient enough to induce allocation of area to vegetables. Why the farmer is not diversifying area towards vegetable when prices of vegetables have been very high? The main reason for slow crop diversification toward vegetables is the high risk-high return pattern of the vegetables. The high risk is due to fluctuating prices in the local markets and a low share in a unit of consumer price. The farmer may not necessarily be a risk averse but has a low risk appetite. Lack of credible institutional mechanism which could result in an increase in his share in each rupee a consumer spends on vegetables is further reinforcing this risk aversion.

1.4 The small size of the local market and its disintegration, have made the prices supply sensitive. But while farmers are not able to benefit from the increase in prices, a fall hits them immediately. Demand for vegetables, in so far as the farmers are concerned is a derived demand, the demand of the intermediaries. The existence of perfect competition among the farmers as sellers of vegetables and a few oligopolistic buyers or middlemen, therefore, results in distortion of the incentive structure. Fluctuating prices of the vegetable, which are kept low by the intermediaries; do not provide enough incentives to the farmers to produce more vegetables. Prevalence of high prices and higher inflation are also due to the high transaction cost of vegetables' transfer and high margins of the middleman. Besides, the perishable nature of the vegetable together with inadequate storage facility, improper demand management and inefficiency in supply chains create huge wastes in transit. In this situation, while increased supplies results in a price crash for farmers, lower supplies does not provide them any economic rent. This further reinforces the risk aversion of the farmers. One option for the efficiency in the supply chains is to encourage organized retail chains.

2. RISE OF ORGANIZED RETAIL CHAINS

2.1 The evolution and patterns of the diffusion process of modern food retail industry has varied worldwide, but its entry and consistent increase in market penetration have had significant implications across all countries including US, European Union and the developing countries of Latin America and East Asia including China¹. For India, the size of food retail in 2008-09 was estimated at about Rs.10,700 billion, which is 61 per cent of the total retail industry. When 95 per cent retail is in unorganized sector, the organized retail (only 5 per cent) is likely to grow at an annual rate of around 11 per cent and is projected to touch business levels of Rs 53,000 billion by 2020. The Agri-food retailing accounts for 18 per cent of the organized retail today and is likely to have a lower share (12 per cent) by 2020². According to ICREAR report annual growth rate of organized retail in food and grocery is estimated at 16 percent during 2004–2007³. Other estimates put the growth rate of

¹ The IFPRI Discussion Paper (2008).

² NABARD study on Organised Agri-Food Retailing in India(2011)

³ Impact of Organized Retail Chains on Income & Employment, ICREAR(2009).

organized food and grocery at higher level of 42 percent in 2006 over 2005⁴.

2.2 The share of expenditure towards food and beverage in total consumption expenditure of the households is expected to decline. Such a decline, as per the Engle Law, is a normal happening as part of the process of development. The organized retail may also, therefore, experience a decline in ratio of their business turnover derived from the sale of food related products. There would, however, be two positive factors. The rising incomes and standards of living are expected to push up the demand for high value foods. The changes in consumer behavior and preferences in favour of processed foods as a result of an increasing participation of women in labour force could help in sustaining the organized retail's share in food and related products. Moreover, increasing urbanization is also associated with a change in the shopping behavior of the middle class due to higher incomes and increasing opportunity cost of time for the consumers (buyers), particularly the women. Improvement in processing technology, progress on account of road connectivity, investment in storage facilities, fast and safe transport and information technology revolution is likely to solve many of the problems of marketing system and provide opportunities to private traders.

2.3 Increased investment in organized retail by domestic and foreign players brings about upstream changes in supply chain and an increased centralized procurement of agri products from farmers as the experience of the East Asian countries suggest. The rapid rise of supermarkets in different countries has transformed their agri-food system, though the speed of transformation has been different. In case of India the transformation as of now has been slow both at upstream and at downstream. In the downstream changes; the retail sector is now open for the corporate to develop supermarket infrastructure, the foreign investment is likely to flow in near future.

2.4 The direct procurement in fresh fruits and vegetables may offer better price, provide knowledge of market demand, technological inputs and access to credit on account of assured market to the farmers. While it is estimated that direct procurement of fresh fruits and vegetables

⁴ The India Retail Report, Ministry of Commerce and Industry, 2007.

could reduce wastage by about 7 per cent and can improve the chain efficiency by as much as 17 per cent, there is no consensus whether the upstream operation of supply chain would be inclusive and cover farmers of all sizes of land holdings. The traditional channel where huge wastage of commodities, lack of infrastructure, missing institution, lack of standardization and moreover lack of incentives to invest in storage facilities, standardization, packaging etc are very much evident.

Experiences of other institutional innovation in agri-marketing

2.5 The experiences of the contract farming, particularly regarding the inclusion of small farmer under contract farming, the distribution of profits between farmers and the contractor, sharing risk by agribusiness firms, and minimization of the adverse impacts on environment and society have led to mixed results. There are various price and non-price effects on agriculture. Some positive impacts of contract farming include the crop diversification, increase in productivity, improvement in the profitability of farmers, improved decision making, increase in wages and employment of agricultural labor and technology transmission. The issue of inclusion is more important because of emerging trends of large number of small farmer in India and decreasing size of land holdings. A small farmer operating predominantly with family labor has many advantages which reduce the cost of labor supervision, cost of monitoring, screening of hired labour, cost of contract enforcement and cost of negotiation⁵. Collectively, it is easier to deal with small farmers by the contracting firms which reduce the possibility to get involved into a conflict. On the other hand, there are disadvantages due to high dependency on farm income which reduces his bargaining power, low capacity to invest restricts (prohibits) implementation of new technology and to experiment with new farming practice and crops etc..

2.6 The small farmer is interested in taking up contract farming because it facilitates availability of modern input, which are either unavailable or could be obtained through other sources at a very high cost⁶. Contract farming also reduces his price risk and eventually stabilizes income. The firms, however, prefer large growers to avoid dealing with large number of small farmers. It is not only easy to bargain

⁵ Key, Nigel and Runsten, D. 1999

⁶ Porter Gina and Howard Phillip K., 1997

with small number of large farmer, it is also advantageous to the firm to reduce the input supply cost, cost of supplying extension services. Large farms have a higher risk taking ability, can put in larger investments in land. They have relatively better quality land more uniform and consolidated. Many studies⁷ reveal that the system of contract farming is skewed towards medium and large farmers, though there were no significant differences in productivity between small, medium and large farms. There was no discrimination in procurement by agribusiness firms as well as price obtained by small and large farmers.

2.7 The exclusion of the small farmer evident in the contract farming, may have severe consequences for rural economy. If firm choose to contract primarily with large commercial farms, then small farmer of the rural population may fail to benefit directly from contract arrangements. In the context of liberalized markets, contract farming that excludes small farmer can lead to more concentrated land ownership and displacement of rural poor⁸. The way contracts and the income earned from contracting – is distributed within a rural community can have important implication for economic and social differentiations within that community⁹. These issues are particularly important in the context of India where 85 percent of land holding are small and marginal holdings and more than 40 percent of rural population is land less. Additionally, there is a social stratification with high-income inequalities in rural areas.

2.8 Even if small farmers are incorporated in contract farming, there is no guarantee that the contracting firm would not exploit or at least provide some benefits to the small farmer. In the absence of representative farmer's organizations, the contract-farming scheme may have a limited regional/ local impact.¹⁰ Large number of small farmer are more prone to remain unorganized due to missing networking, lack of information and limited awareness of organization benefits. In the longer run, however, if the contracting firm becomes pervasive, the farmer may not have any option but to sell their produce through these channels, but if these channel become nonoperational, farmers may need to reverse their contract and switch over to other firm. There are other possibilities

⁷ Kumar Promod (2006)

⁸ Key, Nigel and Runsten, D. 1999

⁹ Korovkin, 1992

¹⁰ Porter Gina and Howard Phillip K., 1997

also; the firm can maximize its short run profits without concerning about sustainability of the farm and the farmer and by exhausting the potential of the region it may switch over to other relatively regions .

2.9 This easy switch over by firm to other region to contract or to procure the produce and any limits on the exit of the farmer from contract may distort the bargaining power equation in the long run in favors of the firm. Some alternatives, however, have emerged. The schemes to promote direct marketing channels are Apni Mandi, Rythu Bazars, Hadspar, Uzhavar Sandies etc. in various States. The promotion of investment in supermarkets and retail chains also is the step in this direction.

Studies of Marketing Efficiency

2.10 There are many studies on estimation of operational marketing efficiency of traditional marketing chains, mostly using the farmer's share in the consumer price. The study of Thakur, (1994) has observed that in case of Tomato, Cauliflower, Capsicum, and Peas in Himachal Pardesh during 1991-92, market efficiency was between 46-52 %. In another study of Karnataka state, during 1985-86, by Kiresur et al, (1989) also revealed the low marketing efficiency (36 to 51 %) in perishable commodities like Tomato, Brinjal, while in case of potato and onion, which are relatively durable vegetables with a longer shelf life, the marketing efficiency was between 60 to 67 %. In a study of wholesale market in Bangalore by Chengappa and Nagaraj (2005), it was found that retail chains had enhanced the farmers' profitability by 10-15% as compared to the traditional channel and reduced the marketing cost by about 4.25% to 8%..

2.10 Despite, the claims that organized retail chains would impact farmers in a better way in terms of enhancement of income, farm efficiency and, updating farmers with market related information etc, these positive impacts on farmers are dependent on the terms and condition of the procurement contract. These terms and conditions define the legality and enforceability of the contract. The design of the procurement contract also provides for some obligations on company and the farmer, which once institutionalized could serve as a model contract, beneficial to both the contracting firm and the farmers.

2.11 The direct procurement contracts, with binding or flexible supply options, need to design an incentive mechanism which benefits farmers. The focus of this paper is, therefore, also on the analysis of the alternative models of direct procurement of fresh vegetables. There are many contracts with different terms and conditions operating simultaneously based on the varying bargaining powers of the contracting parties. However, not all these contracts are sustainable in the future. It may, therefore, be necessary to study of the nature of contracts closely to assess their efficiency and sustainability and their impact on parties. This study examines the relative efficiency of vegetable procurement contracts of Mother Dairy and Reliance Fresh and the traditional channels of marketing of these products and validates the impact through field observation.

3. OBJECTIVES OF THE STUDY

- I. Examination of the design of the alternate Models of direct procurement.
- II. Testing co-movement and uncertainty of the prices of alternate channels.
- III. Estimation of Income effect of the alternative marketing channels on the farmers.

4. DATA & METHODOLOGY

4.1 The study is based on primary data on prices and quantity, collected from growers' payment sheets supplied by Mother Dairy centers from 2005-2007. Procurement centres selected for the study included Puthi, Moi, Rabhra, Balyana and Khandrai in Sonapat district in Haryana. The wholesale prices for respective vegetables were collected from the records of the Marketing Committee of the nearest market. The marketing cost data was collected from farmers during the primary survey. A set of randomly selected farmers are interviewed. The vegetables covered under study were selected on the basis of data availability from the Mother Dairy centres, which are also largest grown vegetables in the sample villages. The vegetables e.g. bottle gourd, carrot, onion, green chilli, tomato, lady finger, cauliflower, and musk melon are included in this study.

5. COMPARISON OF THE ALTERNATIVE MODELS OF THE DIRECT PROCUREMENT OF VEGETABLES

Model: Mother Dairy

5.1 Mother dairy (MD) under the National Dairy Development Board (NDDB) started in 1985 as an organized retail chain of fruits and vegetables in India. The procurement in 1985 was just 250 kg of vegetables which increased over thousand folds to reach 250,000 kg in recent years. In this short span of time it has become largest retail chain in Asia and the second largest in the World. The popular Brand under which MD is doing business is 'Safal'. It procures 40-45 seasonal items of fruits and vegetable from over 17 states in India. Around 22,000 small and big farmers are supplying their produce to MD which are directly linked to it at upstream of the chain. At downstream, there are around 350 outlets spread across the National Capital Region (NCR) Delhi selling the procured fruits & vegetables. The distribution centres at Pallabakhtavarpur and Mangolpuri in Delhi link the farmers and the consumers. At distribution centre huge storage and logistic facilities have been put in place.

5.2 At upstream MD operates through procurement centers spread across the country to procure fresh and quality vegetable from growers. The locally produced top quality vegetables and fruits are procured at remunerative prices from the farmers. Farmers' Associations also exists where farmers elects one President from among themselves. The Secretary, who is also responsible for the entire arrangement of procurement and record maintenance, is appointed by MD. Secretary is entitled to get salary for his services at procurement centre. Major costs incurred during procurement such as payment of salaries to secretary, helper, safai karamchari and rent payment for the land and shed of the centre are paid from the Associations funds. These funds are generated from the contribution of the 1.75 per cent of the total value of procured quantity from the centre. All these costs including the transportation and handling charges including the market fee are deducted from the growers' price. The price paid to the farmer is net of all the charges and costs incurred until the produce reaches the distribution centre.

5.3 Farmers bring their vegetables to the procurement centre on daily basis and after packaging and weighting, these are transported to the

distribution centre of MD every evening. During procurement special care is taken by the staff at procurement centre to ensure that the procurement meets the quality norms of MD. Rest of product is returned to the farmers to be disposed of by them at the nearest Mandi. Mandi, therefore, faces an adverse selection as the products brought are in a way rejects of MD. Besides a loss in terms of the prices, farmers are required to incur expenditure on transportation and marketing. It also involves spending a minimum of three to four hours and have an opportunity cost.¹¹ MD does not lift the entire quantity produced. The secretary at the procurement centre, as the key agent of the MD coordinates the procurement. MD informs the secretary of its requirements on a daily basis and these are communicated to the farmers. Total quantity procured by MD on daily basis, particularly during the peak time of season in terms of the produce, is less than the total produce of the day. Consequently only a part of the farmers produce is procured and not the whole produce, independent of its quality. Being in the nature of perishables, the vegetable cannot be hold, the excess produce, therefore, after supply to MD, is sold in the local Mandi, **(Annexure 2)**.

5.4 MD does not provide the farmers any credit or input support. Vegetable growers, who do not have market surplus of food grains, depend on commission agents for meeting their credit and input needs. Since these farmers bring relatively poor quality of vegetables (as the first grade has already been offered to MD), its affects their credit rating. The farmers visited during the survey were requested to give their opinion on the issue of difficulties faced by them in getting credit. It was observed that the small farmers who mostly grow vegetables have a relatively greater dependency on commission agents for credit and inputs and they are the worst affected.

5.5 The famers also mentioned that the quoted price of the supply is not known at the time of supply. It is only on the next day when the tentative prices are informed. The actual price is delivered to the farmers after ten days when their payment sheet is received by the secretary from MD. The actual weights and quantity that has finally been accepted is indicated only in the grower payment sheet, though tentative quantity and percentage of rejection is informed to the farmer on the next day of

¹¹ IFPRI 2010

the supply. The payment made after ten days of the supply through a bearer cheque.

5.6 The prices are a little more uncertain in MD than in Mandi, in the sense that in Mandi the prices are known to the farmer on the spot. While in MD, first the products are supplied and on next day prices are told to farmers. Comparing with contract farming, in MD there is no price or quantity contract formalized with farmer. The MD is not bound to procure the quantity offered by the farmers. On the other hand MD gives freedom to the farmers to not to supply to them, or sell anywhere else. Compared to formal contract farming, the flexibility which MD offers to farmers is often is risky, particularly to a small farmer, because the prices and quantities procured are determined on daily basis.

5.7 Many of the farmers mentioned during the survey that if they are informed of the prices at the time of supply of their produce, their decision to sell to MD or in a Mandi could be based on better information. The quality control of MD was also reported to be of a significantly higher level and stringent which leaves a sizable portion of produce to be marketed through the Mandi. Some of the farmers also informed that the price told at the time of procurement were higher than the actual prices finally paid. There was also a general observation that MD's procurement was related to the prevailing prices, declining during the period when prices were depressed and that accentuated the risk of the farmers.

Model of Reliance Fresh:

5.8 Reliance Fresh (RF) operates through a procurement centre at each selected village. There is no formal written contract between the farmers and RF they are free to sell to MD or any other channel. However RF centre is more sophisticated and uses better technology including a computer to consolidate procurement information. The manpower at RF is better trained and qualified unlike MD where secretary may not have any technical qualification. The procurement terms and conditions of RF are simple and they give the price information and accept or reject the quality and quantity at the spot. Both, MD and RF procure only best quality products from the farmers and the rest is left with the farmers to be sold by them. There is no farmers association like in MD. The mode of payment in RF is both cash and cheque.

5.9 In this context of the above analysis of the procurement contracts of the MD and RF it seems that the Reliance Fresh contract is relatively better than the Mother Dairy procurement contract in terms of price information, quality monitoring, mode of payments etc. Despite the complexity of the contract of Mother Dairy, it provides a relatively better deal to the farmer as compare to the traditional marketing channels.

6. MARKET INTEGRATION AND UNCERTAINTY IN THE PRICES OF ALTERNATIVE MARKETING CHENNELS

Market Integration

6.1 The MD pricing policy is not based on the local market prices. The prices given to the farmers are determined on the basis 'price quotation' of good quality vegetable from Ajadpur market (terminal market or TM), Delhi. The transportation cost, handling charges and other fees such as salary to the secretary, rent of the land etc are also netted from quoted price. Therefore the price paid by MD to a farmer excludes these charges. However, it may not make significant difference to the test of co-integration because these charges are almost a fixed amount deducted from price quotation. The disintegration, if any, between the MD and TM prices simply indicate that the well connected markets of Sonapat and Delhi are not sharing price signals. To test market integration the respective price series are tested for stationary. It is found that all series are non-stationary at level but integrated at first difference (ADF **results may be seen in table 2**).

Vegetables	Traditional Market Price				Mother Dairy Price			
	At Level	Critical Value	At First Difference	Critical Value	At Level	Critical Value	At First Difference	Critical Value
Carrot	-2.57	-3.51	-5.1	-3.5	-2.23	-4.07	-7.45	-4.07
Lauki	-2.63	-4.23	-5.14	-4.25	-2.62	-4.23	-4.43	-4.23
Green Chilli	-2.35	-4.73	-3.99	-3.76	-0.7	-4.73	-1.52	-4.73
Onion	-2.47	-4.39	-4.97	-3.62	-1.79	-4.39	-4.05	-4.39
Bhindi	-2.9	-4.05	-7.29	-3.45	-3.31	-4.05	-5.65	-4.05
Tomato	-2.57	-4.37	-3.98	-3.61	-2.74	-4.35	-5.52	-4.35
Musk Melon	-2.61	-4.32	-3.63	-4.33	-2.01	-4.32	-3.15	-4.32
Cauliflower	-3.3	-4.35	-3.66	-3.6	-1.7	-4.33	-3.74	-4.33

6.2 The second step towards testing co-integration is to run bivariate co-integration test of Engle-Granger. It is found that except Green Chilli

Onion, and Musk Melon, the prices of local market are co-integrated with MD prices. The non existence of price integration for the green chilli may be because it is not produced in large volume in the villages of the study areas. Non-integration of Onion prices may be because of the nearby Panipat market, which is the major market for onion in this region and just 32 km from the study area. This nearness may be exerting more influence on local markets than the TM. Longer shelf life of onion could be other reason. Musk Melon's TM prices are also weakly co-integrated with MD, though the region produces it in good quantity. TM prices of Carrot, Lauki, Bhindi, Tomato and Cauliflower are co integrated with MD (results are Table.3.).

Table:3. Co integration Results

Vegetables	Eigen Value	Likelihood Ratio	Leg	Co-integration
Carrot	0.06	5.66*	2	Yes
Lauki	0.15	5.99*	2	Yes
Green Chilli	0.23	3.68	2	No
Onion	0.04	0.99	2	No
Bhindi	0.106	11.29*	2	Yes
Tomato	0.15	4.32*	2	Yes
Musk Melon	0.11	3.43	2	Weak
Cauliflower	0.15	4.33*	2	Yes

* Significant at 5% level, Critical value is 3.76.

Variation of Prices

6.3 The Standard Deviation (SD) and Coefficient of Variation (CV) is used as a measure of the prices variation. The net revenue of the MD is observed to be more volatile for all the vegetables except Bhindi and Tomato where as the CV is estimated to be less in MD than TM. This is quite opposite to the notion that the organized retail chains will reduce the volatility of prices for the farmers and consequently stabilize the returns. (Table 4)

Table: 4. Variability of Prices

Vegetables	TM	MD
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	SD	CV (%)	SD	CV (%)
Carrot	114	62	143	63
Lauki	24	111	44	120
Green Chilli	18	76	35	104
Onion	197	50	375	62
Bhindi	38	129#	53	125
Tomato	76	0.86#	80	0.71
Musk Melon	43	0.67	90	0.81
Cauliflower	47	94	51	146

*SD is Standard Deviation, CV is coefficient of Variation

Impact on Revenue

Theoretical relation between elasticity of demand and total revenue:

6.4 Assuming that there are homogeneous goods and many small seller and buyers, objective of a seller is to maximize his profits; with an auctioning system to determine the price in the market through competitive bidding, the market equilibrium is determined by equality of demand and supply and prices are market clearing. The demand curve is assumed to be a negatively sloped and the supply fixed in a day. In the dynamic equilibrium if there are change in the demand and supply in the market this would impact on the farmer trough respective changes in total revenue. The question is how it is going to impact and to what extent?

Suppose

p = is net price (netted by marketing cost) received by farmer

q = quantity sold in the market by a farmer

R = revenue

So, a profit maximizing farmer will calculate its R as

$$R = p \cdot q$$

Taking first derivative of R w.r.t. p

$$R'(p) = q + p \frac{dq}{dp} \text{ or}$$

$$q \cdot \eta_d + q = 0 \dots \dots \dots (1)$$

where η_d = elasticity of demand

$$R''(p) = f'' \left\{ p \frac{dq}{dp} \right\} < 0 \dots \dots \dots (2)$$

Taking first derivative of R w.r.t. q

$$R'(q) = p + q \frac{dp}{dq}$$

$$p \cdot \frac{1}{\eta_d} + p = 0 \dots\dots\dots(4)$$

$$R''(p) = f'' \left\{ q \frac{dp}{dq} \right\} < 0$$

In the situation of profit maximizing the change in total revenue of the farmer would be either because of change in the price or change in the quantity or both. Therefore the total change in the revenue of the farmer is:-

$$dR = R'(p) \cdot dp + R'(q) dq \dots\dots\dots (5)$$

$$dR = q(1 + \eta_d) dp + p \left(1 + \frac{1}{\eta_d}\right) dq \dots\dots\dots (6)$$

Table: 5. The hypothetical values to show impact of price and quantity changes on revenue of the farmer

<i>Elasticity of demand</i>	<i>100% increase in price</i>	<i>100% increase in quantity</i>
0.5	66	33
1	50	50
2	33	66

6.5 The equation (6) explains the relationship between the changes in the revenue of the farmer with respect to the changes in the price and quantity. The changes in total revenue consequent up on the changes in price and quantity are in opposite direction for a given elasticity of demand. *The higher the elasticity of demand the lower would be the increase in the revenue with an increase in the price. There is, therefore, a negative relation between price changes and revenue changes at high elasticity of demand vice versa.* At high elasticity of demand, a decline in price is more effective to increase revenue and at low elasticity of demand the price increase would be a good strategy for having a increase in total revenue. For the quantity changes, there are positive relations between increase in revenue and the elasticity of demand. *The increase in quantity in the market at high elasticity of the demand would also increase the revenue of the farmer while at lower elasticity of demand, any increase in quantity would also decrease the revenue of the farmer. This explains the paradox of the agriculture where good crop season may not be remunerative for the farmer because of low elasticity of demand of the products.* In a situation of bumper crop the increase in the revenue would be less not only due to the depression in the prices but also due to the low elasticity of demand in the market.

6.6 The revenue impact on the farmer generally gets aggravated in case of the vegetable markets because of the nature of commodity and their

yield pattern. Vegetables being the perishables in the nature require storage facilities to reduce the extent of a fall in price. Also the season plays an important role in the yield pattern of the vegetable. Besides, the small size of the market and disintegration in the local markets lead to overreaction of the supply changes on the revenue and through price depressions. Given this inverse relation between quantity increase and the low increase in revenue at low elasticity of demand there are moral hazard for the producers. There is no incentive for the farmers to increase the production when the market demand curve is inelastic, because the increase in the quantity will add less to their revenue. This is all the more true in case of vegetables where the demand is very inelastic. The low elasticity of demand in the local market is the general phenomenon in India. This may be due to the small size of the markets, low integration with other markets or isolated markets.

Empirical estimation of revenue effect:

6.7 The estimation of remunerability of the prices of MD to the farmers is estimated in the following way. Let P_{ij} price of i vegetable for j marketing channel and Q_{ij} is unit of quantity supplied of i vegetable to j marketing channel. MC_{ij} is the per unit marketing cost of the i vegetable for j marketing channel and R_{ij} is the rate of rejection for i vegetable under j marketing channel.

$$NP_{ij} = P_{ij} * (Q_{ij} * R_{ij}) - MC_{ij}$$

$i = \text{vegetable}, j = \text{marketing channel}$

The rejection rate is calculated from the farmer grower sheets and the marketing cost is calculated from the primary data of field survey. Applying rejection rate, R_{ij} , to the quantity supplied we can get the actual quantity for which the price, P_{ij} , is received by the farmer.

6.8 Table: 6 shows that if the farmer sells the same amount of vegetable to either of marketing channels how much average net revenue will accrue to him. For example, for carrot in November 2005, if the Q1 quantity is sold to MD the average net revenue received by farmer is higher at Rs. 221 as compare in Traditional Market only Rs. 192 for the same quantity of carrot. Therefore MD is adding 16 per cent more to the revenue of the farmer for the carrot in November 2005. Except 2007, in 2005 and 2006 the MD has been a more remunerative channel for carrot as compared to traditional market.

Table: 6. Average Net Revenue of Traditional Market and MD Channel

Vegetables	Year	Month	Average Net Revenue MD (Rs.)	Average Net Revenue TM Price (Rs.)	MD Premium (%)
Carrot	2005	Nov	221.2	192.4	16.4
		Dec	312.0	263.4	15.3
	2006	Nov	251.3	161.7	54.1
		Dec	135.5	113.2	10.6
	2007	Jan	77.9	85.8	-10.7
Lauki	2005	Jun	15.8	6.5	189.4
		Jul	87.4	43.8	179.0
		Aug	19.4	6.2	223.0
		Sep	28.3	26.7	47.1
		Oct	13.5	11.1	33.8
Green Chilli	2005	May	8.0	7.7	14.5
		Jun	22.4	17.6	17.3
		Jul	65.5	42.9	43.9
		Aug	29.3	31.7	-7.6
Onion	2005	Jun	581.7	372.7	50.7
		Aug	611.3	390.0	70.0
	2006	Jun	510.7	435.6	16.1
Bhindi	2005	May	65.2	47.1	46.4
		Jun	45.0	29.1	75.1
		Jul	22.9	16.1	42.5
		Aug	23.9	19.1	21.7
		Sept	55.4	33.7	66.8
		Oct	26.9	22.8	14.1
	2006	May	26.1	19.8	33.1
		Jun	20.1	10.4	103.4
Tomato	2005	May	7.8	24.7	7.8
Musk Melon	2005	May	83.8	41.3	104.4
		Jun	114.4	72.1	59.6
		Jul	51.6	40.2	7.1
Cauliflower	2005	Nov	16.3	34.6	-51.7
		Dec	53.4	47.7	-5.3
	2006	Jan	42.8	88.6	-47.2

Difference between Prices

6.9 A regression equation is used to check whether the difference between the MD and traditional market prices is significant or not. First the difference between the prices $D_{in} = P_{i1} - P_{i2}$ of alternative marketing

channels is calculated and then to test the significance of the difference between prices the following equation is specified:

$$D_{in} = a_{in} + b_{int} + u_{in}$$

n = number of observations.

Hypothesis tested are

$$H: a_{in} = 0$$

$$Ha: a_{in} \neq 0$$

The intercept term (a_{ij}) in the function will give the difference in net marketing prices. If the prices are significantly different then the intercept would be significant. The results given in table-7 show that the MD prices are significantly higher than the traditional market prices for the vegetables except Cauliflower.

Table: 7. Results of the above equation

Vegetables	a_{in}	b_{int}
Carrot	93.7*	0.09
Lauki	270*	-2.7*
Chilli	111*	-0.15
Onion	131*	-0.47
Bhindi	222*	-0.01
Tomato	86*	1.77*
Musk Melon	198*	0.26
Cauliflower	-83*	4.02*

Indirect Impact of the MD on Prices:

6.10 The direct procurement of the retail chains also impacts the revenue of the farmers indirectly. Being a credible option for the farmer to sell its products other than local market, it reduces the dependency from the traditional marketing chains. The local markets are relatively small in size and may not necessarily be integrated, and even if these are integrated, it may not necessarily result in transfer of the supplies quickly, and also may not add benefits to the farmers. Therefore any extra arrivals may cause substantial depression in the prices of the local market. Suppose the MD would not have been there for direct procurement the quantity which is now procured by it, the entire produce would have been sold in to the nearest market. The impact of

this extra arrival on the price could have had moderating impact on prices. To calculate the indirect impact of the direct procurement on the local market prices the elasticity of the price w.r.t. arrivals is calculated (see table). Using this elasticity of price the net price impact is calculated for different vegetables.

Table:8 Elasticity of Prices w.r.t. Arrivals (Arr) and procured quantity (PR).

Vegetables	$\frac{dlnP1}{dln Arr}$	$\frac{dlnP2}{dlnPR}$
Carrot	-0.10	-0.16
Lauki	-0.016	0.11
Green Cilli	-0.03	0.11
Onion	-0.048	0.25
Bhindi	-0.097	0.03
Tomato	-0.163	-0.22
Musk Melon	-0.15	-0.15
Cauliflower	-0.118	-0.46

6.11 Using the estimated elasticity of prices of respective i , it is easy to calculate the new price which would have been $New P_{i1}$ if all the produce of i vegetable (i.e. local market arrival plus direct procurement) would have been sold in nearest market. The $New P_1$ is calculated with the following formula and basis of the assumptions that the $New P_{i1}$ cannot be negative and more than P_{i1} , as long as $dlnArr$ is positive:

$$New P_{i1} = P_{i1} (1 - e * dlnArr)$$

Where P_{i1} is the price in Rs. Per Qtls. of a vegetable in the local market, $e = \frac{dlnP1}{dln Arr}$, which is elasticity of local market price w.r.t. Arrivals and $dlnArr$ is the per cent change in the Arrivals. There is significant indirect impact of the direct procurement on the local market prices. Interestingly this benefit is primarily accrued to those who are selling in the local markets. This states that the revenue effect is not only confined to the farmers directly linked to the MD chain but also to other farmers who sells in the local nearest market. The graphs as per **Annexure 1** clearly indicates that the $New P_1$ would have been much lower than P_1 .

7. CONCLUSION

7.1 The supply chain efficiency and inefficiency impacts whole agriculture system. The traditional marketing chains are characterized by high margins of the middlemen, low prices to the farmer, low elasticity

of derived demand, huge wastage of agriculture produce, etc. The new marketing arrangements such as farmers market e.g. Apani Mandi etc, contract farming, and emergence of direct procurement by organized retail chains are hopes for emergence of efficient agriculture marketing. However, there could be problems of exclusion of small farmers, short term view being taken by the contracting company etc., institutional reforms need to reduce the multiple layers of intermediation. The direct procurement is still geographically restricted to the hot spots of the vegetable producing regions, and not for all, and their impact on farmers depends on the terms and condition of the procurement contract. Procurement system adopted by the two agencies, MD and RF, suggest that the approach adopted by RF is more informative in terms of price information, quality monitoring, mode of payments etc.

7.2 This simplicity of the contract of RF could be considered to provide an edge to it, but multiple agencies and a variety of contracting arrangements could co-exist. Because despite the complexity of the contract, MD still provides a relatively better deal to the farmer as compared to the traditional marketing chains. This may be the reason that it has been successful for such a long time in many areas. On the practical side of the impacts of MD it is observed that except Green Chilli, Onion and Musk Melon, the prices of local market are co-integrated with MD prices. The net revenue of the farmers for selected vegetables is found on an average 17 per cent higher for carrot, 134 per cent for Lauki, 17 per cent for Green Chilli, 45 per cent for Onion, 50 per cent for Bhindi, and 57 percent for Musk Melon.

7.3 There are positive spillovers and other indirect impacts on the revenue of the farmers of the direct procurement by MD. The indirect benefits are not confined only to those supplying vegetables to MD, these rather get extended to all those farmers supplying to local Mandi or TM. In short the direct procurement of the MD has enhanced the farmers' revenue.

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Annexure-1



