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Market dynamics and supply chain efficiency of litchi in Muzaffarpur district of Bihar

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Abstract
Litchi (*Litchi chinensis*) is the most important sub-tropical fruit which originated from China about 3,000 years ago. India is the second largest producer of litchi in the world after China. Presently in India, litchi is cultivated in an area of about 74.40 thousand hectares with a total production of 483.60 thousand metric tonnes and productivity of 6.50 metric tonnes/ hectare. Bihar produces nearly 73.38 per cent of total litchi of the country with 40 per cent of the area under cultivation. It is cultivated in an area of about 31.1 thousand hectares with a total production of 227 thousand metric tonnes and productivity of 7.3 metric tonnes/ hectare. It is mainly cultivated in the old districts of Muzaffarpur, Champaran and Darbhanga. In India, litchi maturity starts in the middle of May in the states of Tripura, West Bengal, Jharkhand; end of May and June in North Bihar, followed by Northern Tarai region of Himalaya in Uttarakhand. Litchi is a non-climacteric fruit that possesses poor shelf life and results in very high post-harvest losses. This studies conducted identify the various channels in Litchi marketing ans assess the efficiency of each channels in the district Muzzafarpur of Bihar. Channel I: Producer – Pre - harvest contractor – Commission agent cum Wholesaler –Retailer – Consumer. Channel II: Producer – Village Trader – Wholesaler (local) – Commission agent (distant) – Wholesaler (distant) – Retailer – Consumer. Channel III: Producer – Retailer – Consumer. Channel IV: Producer – Consumer. The producers share in consumer's rupee in channel IV is the highest since it is the shortest channel (68.99 per cent). Where as the producers share in consumer's rupee in channel I, II and III are 33.59 per cent, 11.97 per cent and 42.27 per cent respectively. The marketing efficiency index of channel I, II, III and IV was 0.662, 0.197, 1.129 and 9.05 in the same order indicating the superiority of channel IV.

Keywords: litchi, production, marketing channel, marketing efficiency

Introduction
Litchi is the most important sub-tropical evergreen tree and most renowned edible fruits belonging to the family Sapindaceae, which originated from China about 3,000 years ago. It is botanically designated as *Litchi chinensis* Sonn. (*Nephelium litchi* Cambess) and is widely known as litchi and regionally as litchi, lichee, leechee or lychee. Unlike annual crops, investment on orchards demands vast resources and there is a wide gap between investment and harvesting of crop due to long gestation period. It is highly specific to climatic requirements and probably due to this reason its cultivation is restricted to a few countries in the world.

Litchi is a delicious fruit of excellent quality. The fruit has high sugar content which varies from 10 to 22 per cent due to cultivar and climatic conditions. Besides sugars, litchi contains 0.7 per cent protein, 0.3 per cent fat, 0.7 per cent minerals (particularly calcium and phosphorus) and vitamin C (64mg/100 g pulp), Vitamin A, B1 and B2 are also present in considerable amount.

Litchi being a temperature sensitive fruit, the access to market is constrained by unavailability of cool chain facilities to transport it to distant markets. It is important to reach the produce to distant locations at ambient temperature within 24-36 hours after plucking, in order to retain its desired colour. The supply chain from farm to final consumers outside the state market is not so efficient to maintain the timings. Hence refrigerated trucks and cool chain facilities are essential for targeting larger markets. For export markets, litchi requires some processing to increase its shelf life. Additionally, litchi is also processed for pulp, juices, canned litchi etc. for preservation. Currently, there are about 5 pack houses/ litchi processors in the state. Litchi is negligibly exploited at post harvest level for processing and value addition. This situation would normally encourage effort to develop various litchi products like nut, canned fruits juices, squash, jam, jelly, wines etc. Product diversification will lead to income and employment generation in the agro processing sector.

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Litchi markets can be broadly classified into three categories

- Domestic Market in Bihar
- National Market
- Export market

Marketing of litchi in India is largely dependent on the quantum of the produce available for sale within the state, outside the state, within the country and outside the country. The quality of the produce as per the cultivar codex, infrastructure support for transport and market information system as well as the government policies play a vital role in marketing of highly perishable litchi fruits.

Most of the contractors market the litchi fruits as per their convenience. Some work as commission agents of wholesale merchants, operating from metro-cities, whereas some are financed by merchants and workers on their behalf. Few pre harvest contractors also supply the produce to local processing units and export houses.

The potential of litchi in India is unexploited so far. High price disparities exist between the returns that the producers get and the consumers pay. The Pre-Harvest Contractor or the commission agent makes the maximum margin in litchi marketing, as they only perform a transfer function without involving any other cost. The stockist in litchi sale adopts the undercover system and realizes higher margins.

Considering the importance of this fruit crop in the region, efforts are made to provide technological support through research and promoting production, post-harvest management and marketing, including export, through development programmes. Litchi has also been identified as an important crop for export. Currently, Indian export of litchi remains quite small due to expanded domestic market. The product for export and distant domestic markets is typically packed in 2 kg cartons after pre-cooling and sulphuring. Domestic marketing generally receives litchi in 10 kg wooden cages or 15 to 18 kg baskets.

Materials and Methods
Selection of market intermediaries

The study also intended to study the market functionaries/intermediaries at various levels of marketing and their marketing efficiency. The detail of the market intermediaries was obtained from NRC for Litchi and other sources. About 80 market intermediaries from all the four blocks and distant markets were interviewed, which included pre-harvest contractors, commission agents, wholesalers and retailers etc. A list of all the litchi growers in four blocks was prepared. The relevant information and data were collected from 40 litchi growers and 80 market intermediaries from all the blocks were randomly selected making the total sample of 120.

Four channels are identified based on the preliminary information

Channel I: Producer – Pre - harvest contractor – Commission agent cum Wholesaler – Retailer - Consumer

Channel II: Producer – Village Trader – Wholesaler (local) – Commission agent (distant) –Wholesaler (distant) – Retailer – Consumer

Channel III: Producer – Retailer – Consumer

Channel IV: Producer – Consumer

Cost of marketing

The total cost incurred on marketing, in cash or in kind, by the producer-seller and by various intermediaries involved in the sale and purchase of the commodity till the commodity reaches the ultimate consumer was computed as follows.

$$C = Cf + Cm1 + Cm2 + Cm3 + \ldots\ldots\ldots\ldots.Cmn$$

Where,
C = total cost of marketing of the commodity
Cf = cost paid by the producer from the time, the produce leaves the farm till sale.
Cmn = cost incurred by the nth middleman in the process of buying and selling the product.

Producer's share in consumer's rupee

It is the price received by the producer as a percentage in the consumer's price.

$$Ps = (PF/PC) \text{ X } 100$$

If (Pc) is a consumer's price and (PF) is the producer's price then the producer's share in consumer's rupee (Ps) may be expressed as follows.

Marketing margin of middleman

This is the difference between the total payments (cost + purchase price) and receipts (sale price) of the middleman (ith agency).

a) Absolute margin of the ith middleman(Ami)

$$(Ami) = PRi - (Ppi + Cmi)$$

b) Percentage margin of the ith middlemen (Pmi)

$$(Pmi) = \frac{PRi - (Ppi + Cmi)}{PRi} \text{X} 100$$

Where,
PRi = Total value of receipts per unit table (sale price)
Ppi = Purchase value of goods per unit (purchase price)
Cmi = Cost incurred on marketing per unit

Analysis of price spread under different channels

It is the difference between the price paid by the consumer and the price received by the producer. The price spread was worked out by using following method
Where,
Pp = price paid by the consumer
Pf = price received by the farmer
Price Spread = Pp - Pf

Analysis of Marketing Efficiency under Different Channels

Marketing efficiency is a measure of market performance. The movement of goods from producers to the ultimate consumers at the lowest possible cost consistent with the provision of service desired by the consumers is termed as efficient marketing.

Shepherd's Formula

Shepherd (1965) suggested that the ratio of total value of goods marketed to the marketing cost could be used as a measure of marketing efficiency. The higher this ratio, higher

would be the efficiency and vice versa. This can be expressed in the following form

$$ME = [(V/I)-1]$$

Where,
ME = Index of marketing efficiency
V = Value of goods sold
I = Total marketing cost

Rank based quotient (RBQ)
The constraints faced by the producers and their market intermediaries in marketing of litchi were identified. The quantification of data was done by first ranking the constraints based on the responses obtained and then calculating the rank based quotient (RBQ) (Sabarathanam, 1988) which is as follows
Where,
f_i = number of respondents reporting a particular constraint under ith rank
N = number of respondents
n = number of constraints identified

Results and Discussion
Major findings of the study
Socio-economic profile
It is observed that only 7 per cent of the total respondents were illiterates. About 60 per cent of the farmers were in the age group of 35 and 55. The average family size of the farmers was five. The average size of the land holding was 1.73 hectares and about 95.95 per cent of the total holding was under litchi cultivation.

Trend in area, production and productivity of litchi
The compound growth rates for area, production and productivity of litchi in India during 2001-02 to 2010-11 were 8.861 per cent, 1.397 per cent and 1.416 per cent respectively. Among the all three variables, the growth rate of area is significant.
The compound growth rates of area, production and productivity of litchi in Bihar during 2001-02 to 2010-11 were estimated to be 1.17, -2.89 and -4.04 percent respectively, out of which only area was positive and statistically significant.
The growth rates of area, production and productivity of litchi in the district of Muzaffarpur during the period of 2001-02 to 2010-11 were observed to be -0.57, -3.58 and -2.58 percent respectively.

Marketing
Marketing system of litchi was observed to be a purely traditional private system viz. Litchi merchant comprising pre-harvest contractor, village trader, commission agent & retailer. The pre-harvest contractor is observed to be most important intermediary who performed most of the marketing and other services like watch and ward of orchards, harvesting of fruits, grading & packing of harvested fruit into boxes and transportation of the consignment right from the orchard to distributing centres. Three important channels of litchi marketing were identified and are here under

Channel I: Producer - Pre-harvest Contractor - Commission agent (Muzaffarpur) cum Wholesaler - Retailer - Consumer

Channel II: Producer - Village Trader – Wholesaler (local) -

Commission agent (distant) - Wholesaler (distant market) - Retailer (distant) - Consumer (distant market)

Channel III: Producer - Retailer - Consumer (Muzaffarpur district)

Channel IV: Producer - Consumer

Price spread of litchi
Channel I
The analysis of price spread in the Muzaffarpur market reveals that pre-harvest contractor's share in consumers' rupee was 12.22 percent. The purchase price of wholesaler was Rs 1997.99 per quintal. The wholesaler paid Rs.630.43 per quintal as marketing charges. The highest marketing charge per qtl. (Rs. 44.00/qt) was recorded for packing of litchi followed by spoilage (Rs. 151.39/qt) and transportation (Rs. 156.82/qt). The miscellaneous expenditure (Rs. 55.45/qt) was towards telephones, electricity and other establishment etc.
The retailer's sale price was Rs. 2980.49 per quintal. The charges borne by retailer was Rs. 512.94 per quintal. The total cost of marketing incurred by the contractor/wholesaler worked out to be 17.20 per cent of the consumer's rupee. The producers' share in consumer's rupee was very less due to the fact that producers sell their orchards directly to the pre-harvest contractor/wholesaler. Therefore, more profit is earned by the middleman. The producer's share in consumer's rupee may increase if the producer can sell their produce by bringing it into the market by themselves.

Channel II
The price spread in distant market (Delhi) explains that the marketing costs incurred by the commission agent was the least being only 3.00 percent of the consumer's price. The expenditure incurred by commission agent was minimal due to the fact that the pre-harvest contractor bears all the expenditures except market fee, postal and telegraph charges and other petty charges. The marketing costs borne by retailers were also high i.e., about Rs. 2237.37 per quintal (21.25 per cent) which includes labour charges, transport, spoilage and other miscellaneous charges.
The total marketing costs incurred by pre-harvest contractors, wholesaler and retailers in distant market (Delhi) were Rs. 245.45 per quintal, Rs. 1767.27 per quintal and Rs. 2237.37 per quintal of the total price of Rs. 10524.53 per quintal paid by the consumer. The marketing margin of pre-harvest contractors, wholesaler and retailers were Rs. 474.54 per quintal, Rs. 1767.27 per quintal and Rs. 2237.37 per quintal respectively.

Channel III
Price spread for litchi in supply chain-III indicates that the net share of the producer in the consumer's rupee was 42.27 per cent.The cost incurred by producer on watch and ward, picking, grading, filling, cost of bag/container transportation cost, loading and unloading charges, miscellaneous charges etc. was Rs.255.72 per quintal which is 8.57 per cent of consumer's rupee. The margin retained by the producer amounted to Rs.321.17 per quintal which is 10.77 per cent of the consumer's rupee. Among costs, picking cost is very high which shared 1.47 per cent of total cost paid by the producer. The retailer sold directly to the consumer at Rs.2980.49 per quintal. The cost incurred by retailer on market fee @ 2%, transportation cost, bagging, spoilage, commission @ 6% and miscellaneous charges etc. was Rs.512.94 per quintal which is

17.20 per cent of consumer's rupee. Thus, the margin retained by the retailer amounted to Rs.630.67 per quintal which is 21.15 per cent of consumer's rupee. Among total costs, spoilage losses was high which shared 3.06 per cent followed by the commission charges, transportation cost and miscellaneous cost i.e. 3.69 per cent, 2.63 per cent and 5.74 per cent of the consumers rupee. The price spread which shows the difference between price paid by the consumer and price received by the producer is Rs. 1720.49 per quintal.

Channel IV
Price spread for litchi in supply chain-IV indicates that the net share of the producer in the consumer's rupee was 68.99 per cent. The cost incurred by producer on watch and ward, picking, grading, filling, cost of bag/container transportation cost, miscellaneous charges etc. was Rs.181.69 per quintal which is 9.94 per cent of consumer's rupee. The margin retained by the producer amounted to Rs.384.51 per quintal which is 21.05 per cent of the consumer's rupee. Price spread of this channel is Rs. 566.19 per quintal. Thus the above analysis clearly shows that longer the channel and more the number of intermediaries in the system, bigger the price spread and the share of producer in consumer rupee decline.

Marketing constraints
Different types of marketing constraints in litchi encountered by the farmers and intermediarie. It is well known that litchi is a perishable commodity and do not last long in normal conditions. Therefore high perishability was the biggest challenge to farmers as well the intermediaries, therefore it was perceived as the most important problem with an RBQ value of 99.16. To overcome this problem, there were no proper cold storage facilities available in the area leading to heavy spoilage losses and therefore the respondents expressed this as a second most important constraint with RBQ of 83.23.The other problems faced in marketing are lack of infrastructure, high transportation cost for distant markets, lack of credit facility, formation of syndicate by the dominant market player, price fluctuations etc. in the decreasing order of importance.

Conclusion
It may be concluded from the study that there is an immense scope for expansion of area, production and productivity of litchi in Bihar. The system of marketing reveals that the litchi growers get a very small share in price paid by consumers and there is a need to reduce the long chain of middlemen in the litchi trade. Out of the four channels of litchi marketing, fourth channel i.e. producer –consumer (local market) was the most efficient from producer as well as consumer point of view as the producer could get as high as 68.99 per cent of the consumers rupee while remaining 38.01 per cent of the consumer's rupee was incurred on different marketing costs by the producer/pre-harvest contractor/retailer and the margins of the middlemen. The margin of the middlemen between producer and consumer was found to be Rs.630.67 per quintal in local market and Rs.1774.53 per quintal in Delhi market. Thus the price spread is minimum in local market and maximum in the case of Delhi
Market (distant market). Further it was found that marketing channel efficiency index was the highest in channel IV (9.05) and the lowest in channel II (0.197).
The major problem identified in marketing of litchi are the perishability of the fruits which had the RBQ value of 99.16. The other problems are lack of cold storage, labour shortage,

lack of market information, lack of organized marketing, lack of market infrastructure etc. with ranking of II, III, IV, V and VI respectively.

References
1. Ahmed BJ, Aara RR. Marketing management of Kashmir apple. Commerce and Management. 2012; 1(7):34-40.
2. Anchal D, Sharma VK. Price spread of litchi in Punjab. Indian journal of Agricultural Marketing. 2009; 23(2):157-161.
3. Bhardwaj SP. Conceptual reforms to improve marketing efficiency. Indian Journal of Agricultural Marketing. 2007; 21(3):100-106.
4. Chavan AA, Kalyankar SP, Sinde SV, Wakle PK. A study on marketing of banana in Parbhani market of Maharashtra state. The Bihar Journal of Agricultural Marketing. 2001; 9(3):316-319.
5. Emam AA. Evaluating marketing efficiency of tomato in Khartoum state, Sudan. Journal of Agriculture and Social Science. 2011; 7(1):21-24.
6. Kaur, Gupta. Marketing of fruits and vegetables in India. Indian Journal of Marketing. 2008; 16(2):13-19.
7. Lokanadhan K. Supply chain management analysis of tomato from farm to modern retail outlets. Indian journal of Agricultural Marketing. 2007; 21(3):65-71.
8. Meena, Babu Lal, Pant DC, Sharma JD. Practices and channel for marketing of guava in Udaipur District of Rajasthan. Indian Journal of Agricultural Marketing. 2005; 19(3):68-8