

## Original Research Article

### Value Chain Analysis of Major Pulses in Bihar: A Situation Analysis

Meera Kumari<sup>1</sup>, S. P. Singh<sup>3</sup>, Sk. M. Rahaman<sup>1</sup>, S. L. Bairwa<sup>2</sup> and L. K. Meena<sup>1\*</sup>

<sup>1</sup>Department of Agricultural Economics, Bihar Agricultural University, Sabour,  
Bhagalpur-813210, India

<sup>2</sup>Departments of Agricultural Economics, Dr. Kalam Agricultural College, Kisanganj,  
Bihar, India

<sup>3</sup>Department of Agricultural Economics, Sugarcane Research Institute, Dr. Rajendra Prasad  
Central Agricultural University, Pusa, Samastipur, Bihar-848 125, India

\*Corresponding author

#### ABSTRACT

The main objective of this paper is to enhance the income level of rural producers and stakeholders concentrating on the improved economic channels or market chains. The market map frame work was used to serve two purposes one for, the policy maker and other for rural development planners to formulate related policy and concentrate on product specific market respectively. The crop utilization of main product and by-product indicated that traditionally grown variety of both the pulses were mainly used for consumption purpose. Value chain analysis indicated that 90% of farmers sold their produced just after harvest to the village trader/in local market to meet out the operational expenditure. Producer's share in consumer rupees was worked out to only 60% through main channel used by the majority of famers in study area. Value addition network indicated that about 50% of producers share reduced due to higher marketing margins taken by intermediaries present in channel of marketing (51/kg). Appropriate backward and forward linkages of pulse growers with marketing were also analysed to generate better returns from pulses. The enabling environment from the government policies to support services needs to be reoriented towards enhancing efficiency of selected market in Bihar. Constraints analysis indicated that non availability of dall mills /processing plants in specific location followed by suitable variety not available at the time of sowing, storage problem, Lack of market information for forward linkage with other markets were the major constraints faced by the famers in selected district of Bihar. Further it was also noted that 30 percent of produced get lost every year before to reached into the market.

#### Keywords

Value chain  
Analysis,  
Backward  
linkage,  
Forward  
linkage,  
consumption,  
cost of  
cultivation,  
pulses, Bihar

## Introduction

Pulses are grown on 23 million hectares of area with an annual production of 15 million tons in 2003-04; it has been increased to 25 million hectares in the year 2013-14 and production during the same has been increased from 15 to 19.7 million tones. However productivity has been increased

from 635Kg/ha to 785Kg/ha during the mentioned period respectively. (Suhasini *et al.*, 2013 and Kumari *et al.*, 2016). The net availability of pulses has come down from 60 gm/day/person in 1951 to 31 gm/day/person (Indian Council of Medical Research recommends 65 gm/day/capita) in

2008. The requirement of pulses will continue to increase in future mainly due to ever increasing population and preference for pulses as the cheapest source of dietary protein. Our prime Minister call for second green revolution of the country with emphasis on enhancement of pulse production to ensure food and nutritional security of people also founds the Bihar is most suitable for it.

Despite of these, pulse crops got major setback in Bihar and its area declined from 6913 thousand hectares in 2003-04 to 500 thousand hectare in the year 2013-14. It produces 522 thousand tonnes of pulses during 2013-14 (Govt. of Bihar 2014). This is only 4% of pulse production of the country. However the productivity has been increased from 814 Kg/ha to 1044 Kg/ha, which is higher than the national average. Among pulse crop grown in Bihar Lentil is the only pulse crop whose cropped area increased by 20,000 hectares. Particular reference to major pulses like chickpea and pigeon pea in Bihar, the area and production of both the pulses has been declined, due to growing popularity and public policy emphasis on Rice-Wheat system (Anonymous, 2012). It has been noted that the area under pigeon pea declined over the year by 35 percent and that of chickpea and lathyrus each by about 60 percent (Kumari et. al., 2016 & Salam, et. al., 2013). It was estimated about 22 thousand hectare area of pigeon pea and 42 thousand metric tons production in 2012-13 and its productivity was about 1901Kg/ha. (DES, 2015) It indicates state has huge potential in pulse production. But as for marketing is concerned there is lack of established dal mills in the area dealing with large scale (Kumari et.al. 2016). Market matter to the rural poor. It is increasingly realised that in tackling poverty market related issues including access to information, institution,

and linkage with trade rule are vital condition. Failure to address these issues means that the benefits of other developments threaten to bypass the rural poor. This study will argue that effort to secure, to improve the income of poor rural producers and workers are best pursued through concentrating on the improved overall performance of specific economic channels or market chains. The market map frame work is intended to serve two purposes one for, the policy maker and rural development planners. The maps will also illustrate costs, secondary services required to each stage, critical constraints faced during marketing as well as for value addition at each stages and the relative clout of players along with value chain.

### **Materials and Methods**

The study was conducted in the Bhagalpur district of Bihar. The stratified random sampling method was used for selection of farmers; and snowball sampling method for other stakeholders. Primary data were collected in 2015-16 from the farmers using semi structured questionnaire and in close interaction with various stakeholders as much as 20 Wholesaler, 20 retailers, 20 village trader & a total of 135 farmers were interviewed to understand the value chain. The analysis of data started from cost of production data to compilation, from various producers involved in the cultivation of pulses. Figures used in the analysis were the estimates of the representative sample of farmers adopting advanced technology of farming (improved seed, fertilizers and pesticides) compared it with those farmers who were cultivating pulses without adopting the advanced technology. Other costs (transport, handling, etc.) are the expenses actually incurred across the value chain. The value added at each financial transaction in the chain has been constructed

from the difference in its value (in terms of Rs /kg).

### **Value chain Analysis**

A value chain is a sequence of related business activities (functions) from provision of specific inputs for a particular product to primary production, transformation and marketing, up to the final sale of a particular product to the consumer (GTZ ValueLinks, 2008). It also includes the number of intermediaries performing different functions, like producers, processors, traders and distributors of a particular product linked by a channel through which the product passes from primary producers to the end consumers. Thus, value chain actors, responsible for movement of materials, information and/or services, share an interest in the end-product was considered for analysis, because changes in the end-market affect them both collectively and simultaneously.

### **Mapping**

Mapping is a central element of value chain analysis. It has been used to show the flow of produce from producer to ultimate consumers. The maps can also illustrate costs, value addition at each stage, secondary services important to each stage, critical constraints, and the relative clout of players along a value chain. It is made up of following three inter-linked components: (1) Value chain actors (farmers, dealers, distributors, etc.) (2) Enabling environment (infrastructure and policies, institutions and processes that shape the market Environment), and (3) Service providers (business or extension services that support the value chains' operations).

The data on physical infrastructure in mandis, monthly prices, corresponding

arrivals, and share of the markets (local as well as outside state), etc were collected directly from mandis. All major mandis trading in pulses i.e. Bhagalpur, siliguri and Patna had been covered by the survey for studying the trade channels and value chain mapping for major pulses in Bihar.

### **Results and Discussion**

Production performance of pulses in Bihar & India.

The area under pulses in Bihar indicated a declined rate but productivity of major pulses like chick pea and pigeon pea over the year shown an increased or somewhat stable over the year (fig-1 and 2). Which is an indicative of potentiality of both major pulses production in the state, by and large predominated by cereal- based cropping systems.

However the area under chickpea in India shown an increasing trend due to the fact that some of state has gained area under the chickpea. But its productivity was lower than that of our state. Further it was also observed that drastic changes in area, and productivity of chick pea has been increased from 2008 to 2013. The main reason behind this was due to improved variety demonstration trial under TL-2 project did well in some state.

The other major pulses were pigeon pea, constituted about 12 to 13% in the rainy season cropped area. The area under arhar in Bihar was declined by -1.51 percent during the period and was statistically significant at 1 percent level of significance. The productivity of arhar had shown positive growth rate at state level. In the year 2012-13 there was a drastic change in yield of arhar had been observed indicated in figure. It may be noted that growth in yield of

major pulses in Bihar were more stable than other states and therefore, the study assumes significant importance for the sector as whole. It clearly reveals that pulses were neglected crop in the study districts and farmers were excessive dependence on Rice. The main reasons expressed by the respondents for the cultivation of rice were that, it is stable crop fetches higher yield and is best suited to their marginal lands. Despite of the fact that pigeon pea requires low-input and restore the soil fertility, farmers were reluctant to cultivate rice only in rainy season. That is why majority of area under pigeon pea were on bund despite of fetching higher income without using any fertilizer and other nutrient for their growth.

### **Economic analysis of chickpea & pigeon-pea cultivation in Bihar**

Economic analysis of identified crops is very important to understand the comparative advantage of major crop grown by the farmers.

It could be observed from the graph that total cost of Rs.15392 /ha and Rs. 19280 was spent on cultivation of traditional and improved variety of chickpea respectively in selected district of Bihar. It may further reveal that cost of cultivation associated with improved variety was comparatively more than that of local variety, mainly due to fact that farmer were using own seed for local variety and purchased seed for improved variety. The estimated net return was Rs9388/ha in sample village for local varieties and Rs.19520 for improved varieties respectively. Comparative cost and benefit analysis indicated that pulses crop are more remunerative as benefit cost (1.6) ratio for local and for improved varieties it was estimated higher in Bhagalpur (2.01). It means improved varieties given to farmer were found more suitable in Bhagalpur

districts. Results are supported by the findings of Kumari *et al.*, (2015). However for pigeon-pea the estimated cost and return shown in graph indicated that total cost incurred in cultivation of pigeon pea for local as well improved cultivars were almost same as Rs14500 and Rs14700 respectively. However due to difference in price of improved variety the estimated gross return was Rs 32512 and Rs 42240 respectively for local and improved variety.

### **Value Chain Actors**

#### **Seed Producing Agencies**

New varieties are developed by the ICAR research Station and ICRISAT patancheru, trial at farmer fields and research station in Bihar. There are large numbers of farmers who was still growing traditional varieties of pulses. Therefore; there is enough scope for expansion of newly improved variety suiting to local environment in Bihar.

#### **Input Suppliers**

Input suppliers include fertilizer and agri-chemical companies, government distributors, Small wholesalers (dealers)/retailers (distributors), and even smaller retail shops that sell small quantities of seed, fertilizer and pesticide to farmers. Pesticides are used for, storage and seed treatment and fertilizer application was almost negligible in selected district of Bihar for pulse cultivation.

#### **Government Distributors/ Wholesalers/Distributors**

Some of the wholesalers also supply pesticides, fertilizers along with seeds directly to large farmers as well as to small retailers. They usually earn around 10-15 per cent margin on sale of pulse seed.

### **Retailers/Dealers**

Input retailers operate small shops in the villages/ local market. They buy seeds and other inputs from the wholesalers. They earn usually a margin of 20-30 per cent on sale of seed.

Due to repeal of APMC in Bihar huge no of intermediaries were involved in marketing of major pulses in Bihar.

### **Producers-Farmers**

Most of the farmers have been practising the same crop rotation pattern of rice and wheat on the same fields for years rather than alternating with other crops. Smallholder farmers used the grain for family consumption, and the surplus is sold in the nearby market /primary market.

### **The Enabling Environment**

The enabling environment consists of critical factors that shape the value chain ecosystem and operating conditions. These “enabling environment “factors are created by organizations (national and local authorities, research agencies etc.), and institutions (policies, regulations and practices) that are beyond the direct control of economic actors in the value chain.

The purpose of charting this enabling environment was to understand the factors that affect the entire value chain and to examine the powers and interests that are driving the change.

Under this due to prevailing practice of unorganised /unregulated markets, not a single product specific market of specific commodities, like whole pulses, dall mill, besan and sattu markets were available so far in Bihar

### **Service Providers**

#### **Business and Extension Services**

In most effective value chains, the actors who actually form the chain (i.e. transact the main product) are supported by business and extension services from other enterprises and support the organizations catering different needs such as input supplies (seeds, fertilizers, irrigation, etc.), market information (prices, trends, buyers, and suppliers), financial services (such as credit, savings or insurance), transport and logistics, etc. There is a consistent need for all the chain actors to access these services timely and efficiently. The Market Map framework is concerned with mapping these services that support, or could potentially support, the value chain’s overall efficiency.

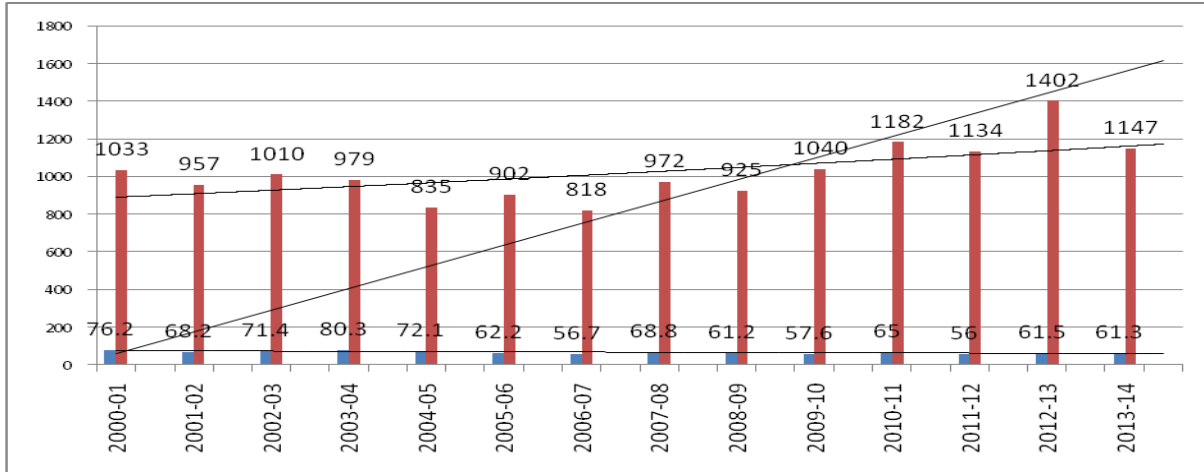
#### **Services involved in value chain analysis of pulses in selected district of Bihar**

Main services started from input supplier, Farmers of selected district they get input from the local input dealers. But due to lack of market information seed replacement rate in these villages were low i.e. only 10 percent of farmers replaced seed every year, remaining 90 percent of farmers used their own seed for the purpose of production.

Under the enabling environment finance policy, business regulation, land policy, trade standards, quality assessment institution like BAU etc. are the main services provider needed to involve more for effective functioning of value chain.

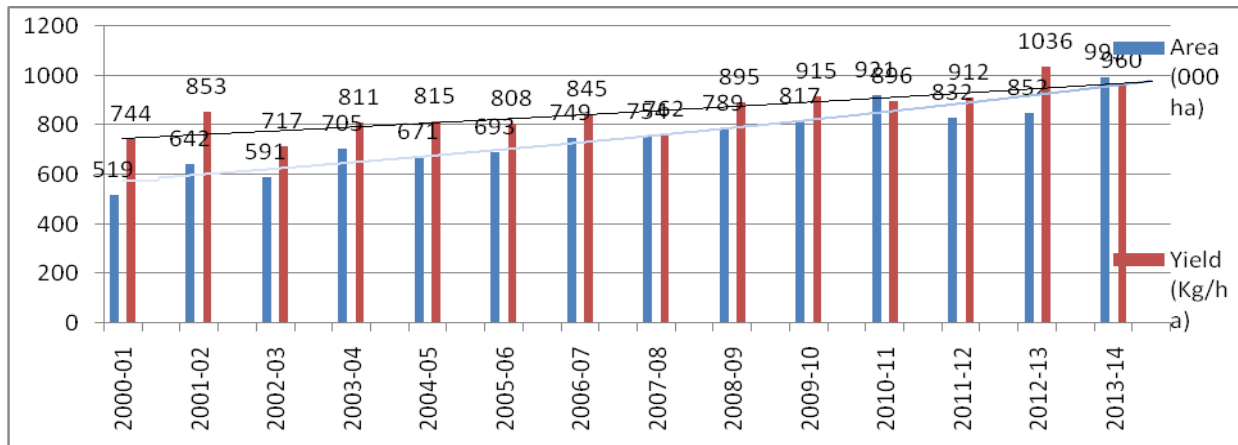
However main services involved while transaction of pulses in Bihar were control and support, packaging, marketing, storage, processing and finally move the commodity through different identified channels of marketing.

**Table.1** Area and yield of chickpea in Bihar (2001-2014)



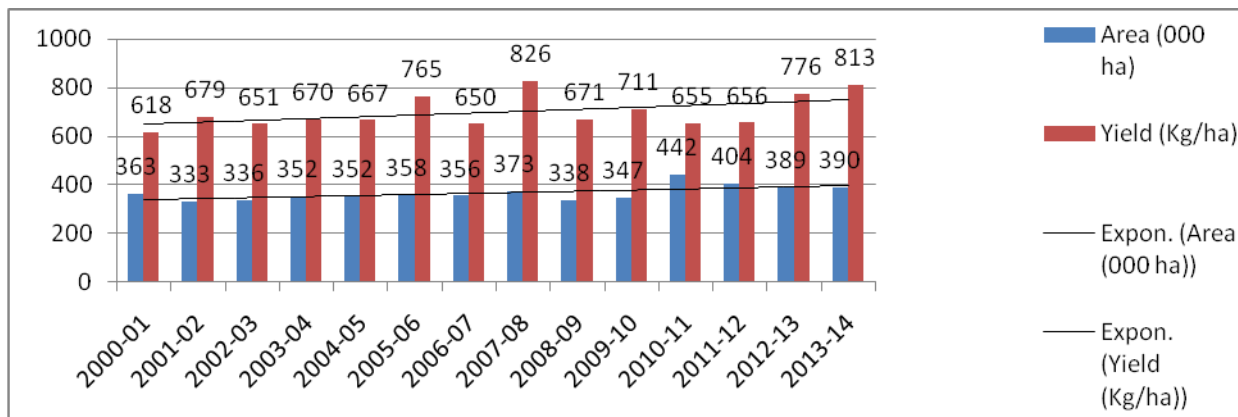
Source: Directorate of Economics & Statistics, Govt. of Bihar (compiled by the Author)

**Table.2** Area and yield of chickpea in India (2001-2014)



Source: Directorate of Economics & Statistics, Govt. of Bihar (compiled by the Author)

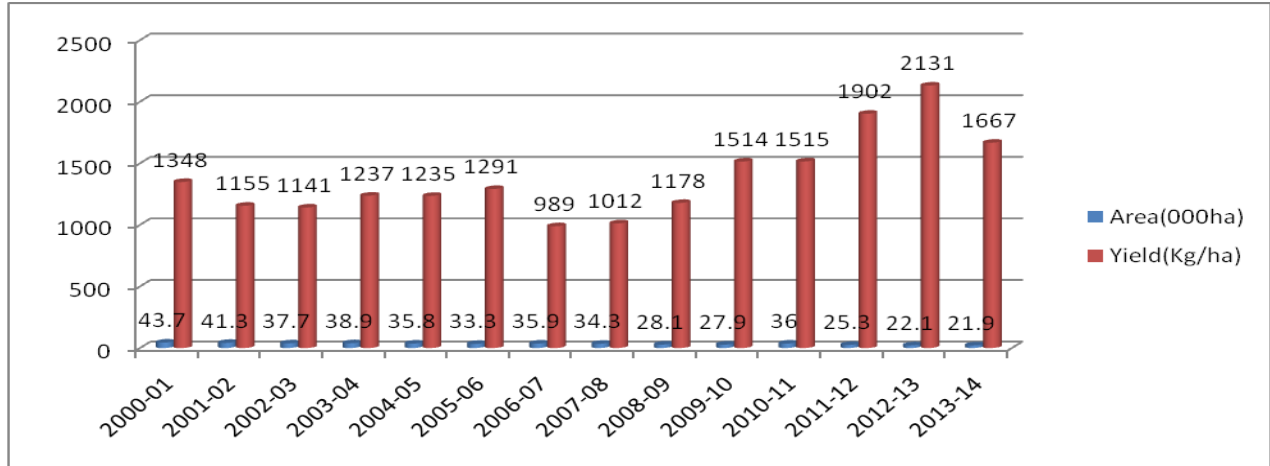
**Table.3** Area and yield of pigeon pea in India (2001-2014)



Source: Directorate of Economics & Statistics, govtn. Of Bihar, (compiled by the Author)

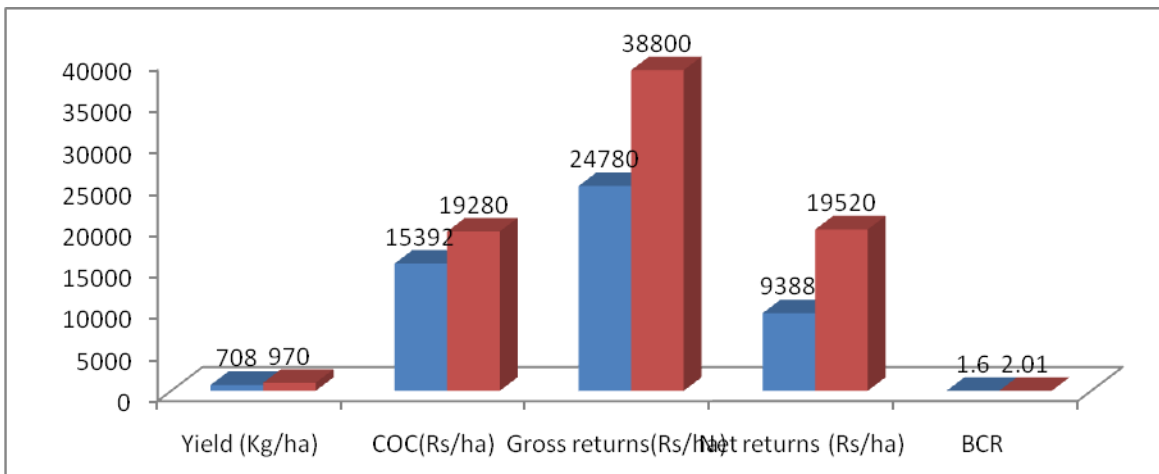


**Table.4** Area and yield of pigeon pea in Bihar (2001-2014)



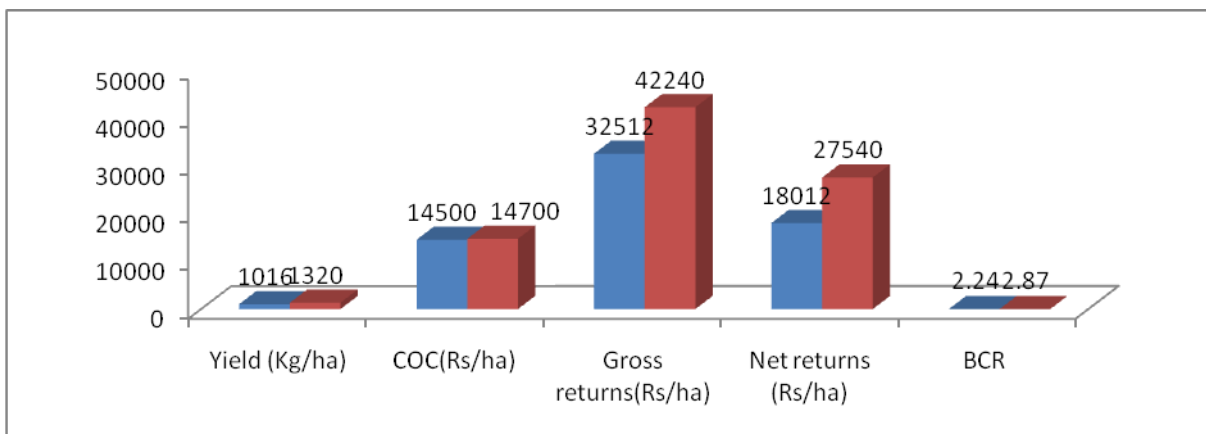
Source: Directorate of Economics & Statistics, Govt. of Bihar, (compiled by the Author)

**Table.5** Economic analysis of chickpea in selected district of Bihar

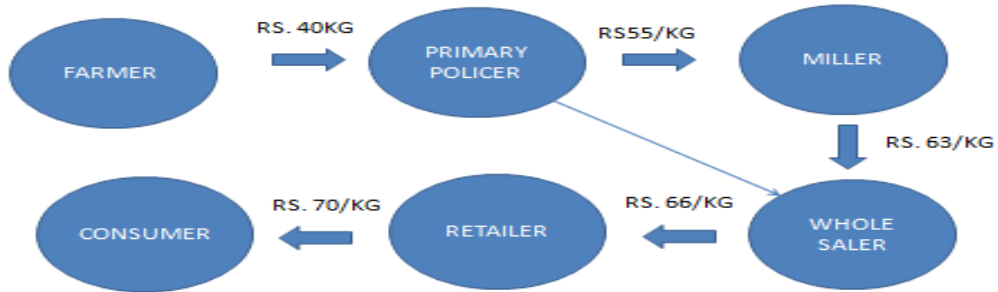


Source: Directorate of Economics & Statistics, Govt. of Bihar (compiled by the Author)

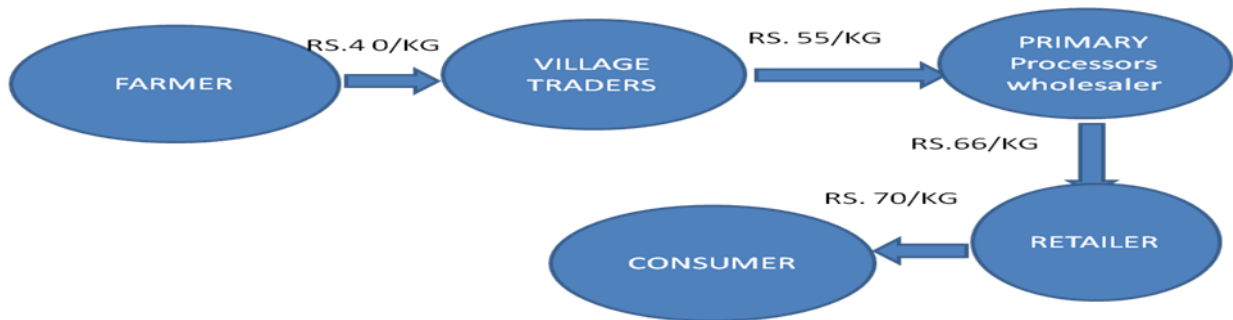
**Table.6** Economic analysis of pigeon-pea in selected district of Bihar



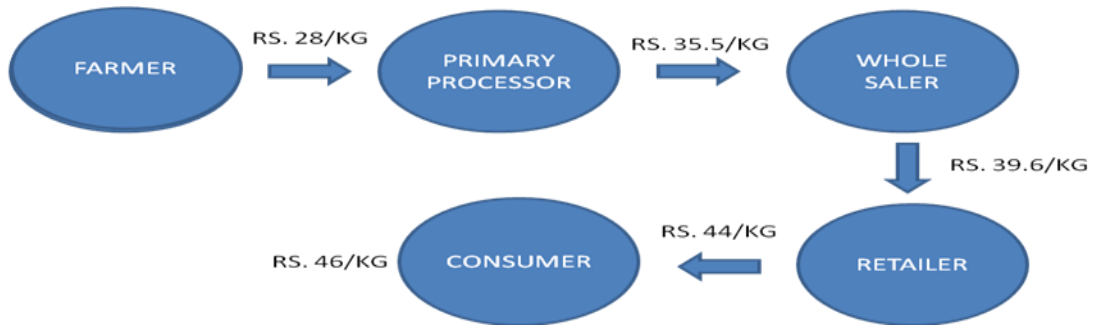
**Channel-I**



**Channel-II**



**Channel -1**



**Channel-2**





**Services involved in value chain analysis of pulses in selected district of Bihar**

<b>Network 1(daal)</b>	<b>Network 2(sattu)</b>
Producers share in consumer rupees was estimated as 68.86 percent	Producers share in consumer rupees was estimated as 31.11 percent
Marketing cost was Rs5.05/Kg	Marketing cost was estimated Rs10.97 /Kg
Marketing margin was 12.95/Kg	Marketing margin was Rs51/Kg
Total cost was Rs 18/Kg	Total cost was Rs62 /Kg

*Source: Calculated from the network-1 & 2*

The total surpluses available with the farmers were not traded in the state, 80- 85 per cent of produce traded outside the state i.e. to Siliguri & Kolkata for value addition. Traders import pulses from MP and Maharashtra also.

The prevalent channels followed in selected districts of Bihar for transaction of, whole pulses, Dall, and sattu are given below.

Producer – Village Trader – Dall Miller – Wholesaler – Retailer – Consumer,

Producer – Dall Miller - Retailer - Consumer,

Producer – Wholesaler – Dall Miller - Retailer – Consumer

Producers share in consumer’s rupees of pigeon pea in selected district of Bihar indicated that farmers received only Rs 40/kg for their whole grain followed by the primary polisher whose main work was only to polish the dall, taking Rs 15 /kg for transaction.

However from miller to consumer the marketing margin varied from Rs 11-17 at subsequent stages of marketing. If primary producer assume the function of village trader one can reduce the margin of seven rupees per kilogram during the transaction of daal. As pigeon pea has not much alternatives uses like chickpea.

Figures indicated the main channel through which major pulses in Bihar passes from producer to ultimate consumers. However for chickpea its value-chain network for whole grain to daal, sattu and besan has been analysed and presented in the table -

It could be observed that in value addition the cost incurred was just double to the whole grain in processing the daal through the identified channels -1, and producers share was reduced to half i.e. 31 percent followed by margin taken by intermediaries’ was 3-4 times more in network two. (Kumari *et al.*, 2016)

It could also be seen that due to unavailability of processing machine at large in Bihar, commission agent were taking huge amount of margin of Rs of 51/kg involved in the processing of sattu and besan. The cost of marketing from these identified channel were estimated as Rs 11 which is double of the network- one i.e. network identified for marketing/processing of dall. The total cost of marketing of daal was estimated as Rs 18 and for sattu it was Rs62. Hence, Producer’s share in consumer’s rupees was estimated only 32 percent in channel –II and 68.86 percent –I, respectively. Therefore market is said to be more efficient market whose producers share in consumer’s rupees will be more. It may be concluded that due to value addition the total cost of marketing and share of profit taken by the individual’s presents in

the channels has been increasing as many as no of intermediaries increases. If these functions will be assumed by the producers itself as a processor, cost as well as margin of profit taken by the commission agent will spread and finally benefit will be go to the producers and consumers. Marketing of Pulses in Bihar go through a large supply chain which drives up the prices of consumers. This is generally due to large number of intermediaries present in the channels of marketing. Guy *et al.*, (2001) also found similar results in their study on pigeon pea production systems, utilization and marketing in semi-arid lands of Kenya.

It has been estimated that each middle men in the supply chain takes at least 1 to 2 % commissions on their sales. There is a good scope for pulses industry also that's why special attention in these areas needs to be exploring the technology for optimization of pulse production and develop the suitable marketing strategy in the study district and state as a whole. This will certainly helpful for accelerating the income of producer at some extent.

Bhagalpur and Banka has emerged as one of the most promising district in terms of pulses production in Bihar. However, performance of pulses in the Bihar state has been adversely affected by the non-price constraints. Despite of release of many improved cultivars by public institutions, the new pulse varieties have not been taken up by the farmers as enthusiastically as was expected. This may be due to inadequate facilitation of the promotional activities and weak horizontal linkages among research, extension and seed companies. It has been observed that public research institutions though have adequate R&D facilities, lack the marketing bent to popularize their products. The farmers have also felt that the improved varieties need huge capital

investment in terms of assured irrigation and fertilizer to respond to their potential. This has undermined the extent of adoption of improved seed with the probable consequent effect of high seed prices brought about by reduced economies of scale. There is need to harmonize existing laws and regulations besides ensuring good and stable producer prices; quality farm inputs and improved extension services. Public research institutions should also evolve measures to take their products to the growers, demonstrate the potential of the seeds developed and produce the seed materials adequately to fill the gap left open by the private players. Most importantly, is to develop the efficient and integrated pulse grain as well dall mill to drive the sector hand-in-hand with the other competitive crops. The growth and instability of pulses crop shows significant growth with respect to productivity however area and production over the period of time shown declining trend. Instead of depends upon only farming farmers can go for subsidiary agribusiness, "Mini dall mill" as well as processing of sattu is one of the good agribusiness opportunity in that area.

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