

**ECONOMIC ANALYSIS OF PRODUCTION &  
MARKETING OF MAJOR PULSE CROPS IN *Kandi*  
BELT OF JAMMU DIVISION OF J&K STATE**

By

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(J-16-M-458)

Thesis submitted to Faculty of Postgraduate Studies  
in partial fulfillment of the requirements  
for the degree of

**MASTER OF SCIENCE IN AGRICULTURE  
AGRICULTURAL ECONOMICS**

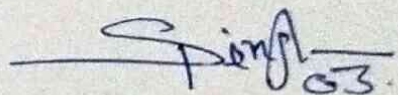


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Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu  
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**2019**

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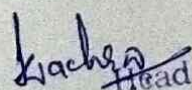
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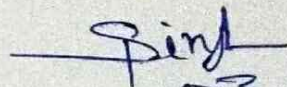
  
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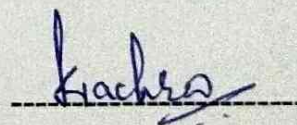
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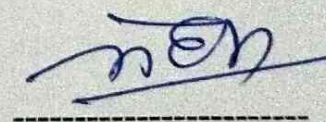
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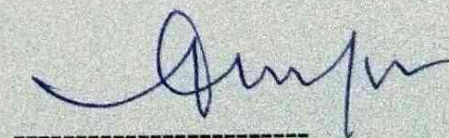
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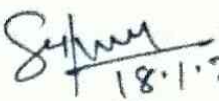
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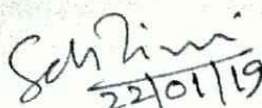
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*To reach a goal, you don't need to know all the answers in advance. But you must have clear idea of the goal you want to reach. Success is possible only after involvement of many minds and hands to beautiful it. Emotions cannot be expressed in words because then emotions are transformed into mere formalities. Nevertheless formalities have to be completed. My acknowledgements are many more than what I am expressing here.*

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**ABSTRACT**

Title of the Thesis : “Economic Analyses of Production and Marketing of Major Pulse Crops in *Kandi* belt of Jammu Division of J&K state”

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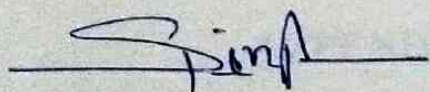
Discipline : Agricultural Economics

An investigation entitled “Economic Analysis of Production and Marketing of Major Pulse Crops in *Kandi* belt of Jammu Division of J&K state” has been conducted in two development blocks of Samba district during the agricultural year 2017-18. Five villages from each block have been selected randomly. Further, from each village 12 farmers have been selected randomly so as to constitute a total sample size of 120. Primary data on area under major pulse crops, costs, production, returns, and information on marketing of the major pulse crops have been collected by interviewing the farmers and different intermediaries in various marketing channels with the help of an especially structured and pretested schedule. Cobb-Douglas production function model has been used to study the relationship between output and various inputs. It was found that the cost per hectare stood highest for gram with figures standing at ₹ 28576.66 followed by urd bean for which figures were ₹ 23239.66 and moong bean (₹ 21200.66). The Variable cost also showed a similar pattern and was found highest on Gram (was ₹ 13288.96) followed by urd bean (₹ 12367.72) and moong bean (₹ 17348.56), respectively. The gross return per hectare of all farms were found least in the case of moong bean (₹ 27625.00) followed by urd bean (₹ 32100.00) and stood highest in case of gram (₹ 34944.00). Further analysis showed that the Net Returns over Cost  $C_3$  were found highest for urd bean with the figures standing at ₹ 8860.34 per hectare followed by Moon bean for which the figures stood at ₹ 6424.34 per hectare and least were in the case of Gram with figures of ₹ 6367.34 per hectare. The Benefit Cost Ratio (BCR) was highest in case of urd bean crop and it is found to be 1.38 followed by 1.30 and 1.22 in moong bean and Gram crops, respectively. The analysis of resource use efficiency of urd bean, moong bean and Gram by Cobb-Douglas production function and analysis of marginal value product were done which revealed that in the case of urd bean, the resource use efficiency of machine labour, human labor, seed and plant protection chemicals were positive with their values at 3.26, 1.17, 8.00 and 7.70, respectively and the resource use efficiency estimated for fertilizer was negative with its values at -0.095. There is further scope of increasing the productivity and return by using more machine labour, human labour, seeds and plant protection in this crop. In the case of moong bean the regression coefficients of seed was found to be significant at 1 per cent level of probability and human labour was found to be significant at 5 per cent level, with their values at 2.70 and

0.98. There is further scope of increasing the productivity and return by using more human labour, machine labour, seed, fertilizer and plant protection. In case of Gram crop the resource use efficiency of plant protection chemicals was found to be negatively significant at 10 per cent level of probability with their value at (-) 4.49. There is further scope of increasing the productivity and return by using more human labour, machine labour, and fertilizer use. The marketed surplus was also highest in case of gram with 4.60 quintal/ha. followed by urd bean with 3.53 quintal/ha. and moong bean with 2.68 quintal/ha. Three types of marketing channels like (1) Producer - Village trader - wholesaler -Retailer – Consumer; (2) Producer – Wholesaler – Retailer - Consumer and (3) Producer –Consumer are found in the study area. Tabular analysis revealed that the Producer's share in Consumer's Rupee was lowest in case of Channel-I followed by Channel-II and it was 100 per cent in the case of Channel-III for all the three crops. The marketing efficiency, in case of urd bean, was found maximum in channel-III (3.11), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 2.09 in channel-II and 2.03 in channel-I. In the case of moong bean the marketing efficiency was found maximum in channel-III (6.47), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.56 in channel-II and 3.45 in channel-I. As far as Gram was concerned, the marketing efficiency was found maximum in channel-III (5.98), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.13 in channel-II and 3.02 in channel-I.

The major production constraints faced by pulse producers were high labour cost, unavailability of labour during peak period, lack of finance and credit facilities and lack of good quality seed whereas on the marketing side the major constraints found were lack of remunerative price for the produce, unorganized market, high cost of transportation and lack of market information.

**Keywords: Costs, Returns, Resource Use Efficiency, Marketing Efficiency, Constraints.**



**Signature of Major Advisor**



**Signature of Student**

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# INTRODUCTION

## **CHAPTER 1**

### **INTRODUCTION**

Agricultural sector is the backbone of Indian economy providing employment to people about 52-58 per cent (Census 2011) to the total population and contributes about 13.9 per cent of Gross Domestic Product (GDP) (Agricultural Statistics at a Glance, 2014). The development in agricultural sector is continued to be essential for food & nutritional security of the population. In the Indian context, rice, wheat, maize, millets and pulses are the major food crops. Ensuring nutritional security to a growing population and sustainable crop production are priorities for scientists in India, where pulses play a key role. Pulses are an integral part of many diets across the globe and they have great potential to improve human health, conserve our soil, protect the environment and contribute to global food security. The United Nation, declared 2016 as “International year of pulse (IYP) to heighten public awareness of the nutritional benefits of pulses as part of sustainable food production aimed at food security and nutrition (FAO, 2016).

Pulses are a critical and inexpensive source of plant-based proteins, vitamins and minerals for people around the globe. They have a low fat content, contain zero cholesterol, and are a significant source of dietary fibre. Moreover, they contain no gluten and are rich in minerals and B vitamins, all of which are important for a healthy life. From an agricultural point of view, multiple cropping systems that include pulses enhance soil fertility, improve yields, and contribute to a more sustainable food system. It is particularly noteworthy that pulses have a very low water footprint compared with other protein sources, and can be grown in very poor soils where other crops cannot be cultivated. Crop residues of pulses, and legumes in general, can also be used as animal fodder, thus increasing the quality of the animal diet. Furthermore, pulses can play an important role in climate change adaptation, since they have a broad genetic diversity from which climate-resilient varieties can be selected and/or bred (FAO, 2016). Several studies have shown that legumes are been associated with long-lived food cultures such as the Japanese (soy, tofu, natto, miso), the Swedes (brown beans, peas), and the Mediterranean people (lentils, chickpeas, white beans) and that they could be an important dietary factor in improving longevity. Pulses add 0.15-0.25 per cent organic

matter to the soil in the form of their roots after harvesting of the crop and improve soil fertility by fixing atmospheric elemental nitrogen in the soil and improve soil structure and water absorbing as well as water retention capacity of soil. Apart from the cheapest source of protein in human as well as animal diet, beside grains, green fodder of most of the pulses is also rich in protein and is palatable feed for cattle. Due to their plant type and ideal maturity durations, most of the pulses can be fitted in various cropping systems including relay cropping (Sharma, 2001).

In the world, pulses are grown by 171 countries. In India the cereals and pulses occupy about 3/4th of the gross cropped area under cultivation. Millets and pulses registered an increase in productivity to the extent of 30-35 percent increase (Agricultural Statistics at a Glance, 2014). India is the largest producer (18.2 million tonnes, largest consumer (22 million tonnes) and the largest importer (3-5 million tonnes per year) of pulses. In India, the pulses are grown in around 24-26 million hectares of area producing about 17-19 million tonnes of pulses annually and accounts for over one third of the total world area and over 20 per cent of total world production (Meena et. al., 2014). However, during the last decade, growth in pulse production has increased significantly. The total pulse production has been increased from 6.43 million tonnes to 19.78 million tonnes, while yield has been increased from 377kg/ha to 689 kg/ha during the period from 1950-51 to 2013-14 (Anon., 2013). Also, there is a steep increase in the price of pulses due to short supply to meet the growing demand due to population increase coupled with back to back monsoon failures. But the net availability of pulses has come down from 69gm/day/person in the year 1951 to 39.4 gm/day/person (Directorate of Economics and Statistics) in 2011.

More recently, under the National Food Security Mission (NSFM), high priority has been given for increasing the production of pulses across the country to curtail growing imports, arrest protein malnutrition and make pulses available at affordable price to the common people. Recently, the Govt. of India has announced the implementation of a Pulses Programme, with an outlay of ₹ 4.05 billion, over the next four years to achieve self-sufficiency in pulses. The target set for production is 23.5 million tonnes by 2020 and 27.5 million tonnes by 2025, while the target for average yield has been set at 900 Kg/ha. by 2020 and 1000 kg per ha by 2025 against the current average yield of 750 kg

per ha. The area under pulses crop is targeted to reach 26 million ha by 2020 and 27.5 million ha by 2025 against the current area of 24 million ha.

Pulses are grown across the country with highest share coming first from Madhya Pradesh (26.41 per cent), second from Maharashtra (16.19 per cent), and then followed by Rajasthan (12.82 per cent), Uttar Pradesh (8.87 per cent), Andhra Pradesh (8 per cent), Karnataka (7.63 per cent) followed by Gujarat (3.84 per cent), which together accounted about 84 per cent of the total pulse production, while the remaining 16 per cent was contributed by Gujarat, Jharkhand, Bihar, Chhattisgarh, Tamil Nadu, Orissa, West Bengal and others (Agricultural Statistics at a Glance, 2014). The estimated production of pulses during the year 2017-18 is 25.23 million tonnes which is record production. In J&K state, the area under pulses was to the extent of 27440 ha with an annual production of 141 thousand quintals during the year 2011-12. Jammu region is ahead of Kashmir both in area (17681 ha) and production (71 thousand quintals) of pulses. Among Pulses, chickpea (45.1 per cent) occupies the major share. In the same time much of the pulses production has slowly shifted from Kharif to Rabi season with a share of around 60 per cent of the total pulse production. Therefore, more emphasis is required to be given on Rabi pulse crops (Reddy, A. A., 2013). As far as area, production and yield of mungbean in J&K is considered, it was found to the extent of 1.4 thousand hectare, 0.8 thousand tonnes and 587 kg/ha, respectively for the year 2014-15 whereas for urd bean, it was found 97.5 thousand hectare, 82.3 thousand tonnes and 845 kg/ha, respectively (IIPR Kanpur).

Being the largest pulse producing country, there is stagnation in the area under pulses production. In India the important reasons for stagnation of production of pulses is the replacement of pulse area by high yielding varieties of cereals and other crops following expansion of irrigation facilities in dry areas. However, there is also a gap between potential and actual yield. Bridging the gap would substantially increase country's pulse production. In addition to that the potential areas of pulses may be identified and supported technologically and institutionally to increase area under pulses. To meet the domestic requirement, there is need to increase the pulse production which can be increased either by bringing more area under cultivation or by enhancing their productivity. Keeping in view the above points, a research study entitled, "Economic

Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state”, has been undertaken.

### **Objectives of the study**

The present study entitled “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state” shall be undertaken with the following objectives:

1. To analyze the costs and returns of major pulse crops in *kandi* belt of Jammu division
2. To evaluate the production efficiency of major pulses in the study area
3. To estimate the marketing efficiency in marketing of major pulse crops and examine the major constraints in the production and marketing of major pulses in the study area.

### **Importance of the study**

The study of costs & returns, marketing channels, marketing cost and marketing margins will help in estimating the cost incurred in production and marketing of major pulses in relation to the prices received by farmers and the proportion of margin being contributed by other players involved in the movement of pulses from producer to consumer. The study will help in identifying the reasons for building up of higher costs and margins in marketing of pulses so that possible ways to reduce them could be suggested. All the measures suggested are expected to help in increasing the pulses production and in turn enhance per capita availability.

### **Limitations of the study**

This study doesn't claim to be free from limitations. Major limitations of the present study are given below:-

- The result of this study are situation specific.
- The empirical estimation is based on data collected from different published records and reports and therefore validity of data cannot be questioned.

# REVIEW OF LITERATURE

## CHAPTER 2

### REVIEW OF LITERATURE

This chapter is devoted to review pertinent literature keeping in view the research entitled, “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state”. For any research, a review of the past studies related to the subject is useful in several ways. It helps in defining concepts and operational definitions, in formulating testable hypotheses, choice of analytical tools as empirical models and in evaluating the findings of the research. Keeping this in view, a brief account of the work related to the present study has been compiled in this chapter and presented in sequence of the objectives given in preceding chapter.

#### 2.1 Costs and returns

In the form business, knowledge of cost concepts enables the cultivators to adjust and coordinate production resources for their profitable use. In this view, few cost and returns studies relating to the crops undertaken by different research works have been reviewed in subsequent paragraphs.

Acharya (1985a) revealed that the pulse growing farms were characterized by larger size, low irrigated area and mono cropping. Mixed cropping of pulses was predominant in the *kharif* season. The use of yield increasing inputs, especially fertilizers and plant protection measures, was negligible. It appeared that there was a considerable technological lag in pulse production which called for the manipulation of input-output prices in favour of pulse crops.

Jain *et al.*, (1994) conducted a study on economic analysis of major *rabi* season crops in Bundelkhand zone, Madhya Pradesh state, India and indicated that chickpeas produced the highest return (₹ 9383/ha) followed by wheat (₹ 8283/ha), mustard(₹ 8071/ha) and linseed (₹ 7376/ha). Chickpeas were also associated with the highest cost-benefit ratio (2.72) followed by mustard (2.71), linseed (2.51) and wheat (2.20).

Burnside *et al.* (1994) reported that in the North Central part of the U.S. dry bean yields were similar with low or high level of tillage treatments but use of mechanical plus chemical weed control system make common bean production very economical in the region and resulted into higher net returns (bean market value minus production cost).

Tomar (1994) reported that a large gap existed between on farm and research station yields. First line demonstrations were carried out on cultivar's field in Tikamgarh district during 1991-92, 1992-93 to test research finding on farmer's fields and to disseminate suitable improved varieties, better agronomic practices and improved plant protection measures compared with local practices. The demonstration plots provided returns of ₹ 4180, ₹ 9945, ₹ 9448 and ₹ 9662 per hectare for summer moong bean, chickpeas mustard and soybean, respectively, compare with ₹ 1376, ₹ 3940, ₹ 4471 and ₹ 4180 per ha, respectively, for the plots with indigenous practices. The percentage increased in the cost benefit ratios were observed to be 90 per cent for summer moong bean and mustard, 75 per cent for chick pea and 56 per cent for soybean demonstration plots.

Tiwari *et al.* (1998) examined the economic analysis of *kharif* crops and revealed that paddy and maize can be grown profitably using improved practices, pulse crop and oilseed crop (soybean) were profitable under both traditional and improved practices. The potential exists for increasing productivity and net profit of other pulses and oilseed crops. It was concluded that paddy, maize, arhar, soybean and sesamum crops could be grown economically in the *kharif* season using improved practices under northern hill zone of Shahdol district of Madhya Pradesh.

Asmatoddin *et al.* (2009) studied the economic analysis of pulses on medium farms and revealed that, in case of soybean per hectare cost of cultivation was ₹ 11355.60 and net profit was ₹ 4761.86 and in case of pigeon pea and green gram per hectare cost of cultivation was ₹ 12632.42 and ₹ 8935.48, and net profit was ₹ 2012.16 and ₹ 3292.80, respectively.

Shukla *et al.* (2009) reported that the farmers adopt traditional practices and method for cultivation of crops. By adopting modern methods of production, they can

increase the yield and reduce the cost of production. Cost of production is calculated including cost of ploughing and field preparation, manures and fertilizers, plant protection, irrigation, planting materials, labour and farm implements.

Reddy and Reddy (2010) studied that there is a scope of increasing area under lentil during the *rabi* season, as its cost per hectare is less with higher net returns than the competing crops like wheat, gram and mustard in water-deficit and resource-poor conditions. They also revealed that lentil-based cropping systems are profitable and also have high water productivity, hence are suitable for mostly un-exploited rice-fallows under water-deficit conditions.

Kumar *et al.* (2012) studied that Costs and returns of major cropping systems in northern transition zone of Karnataka and found that net returns over total costs in maize, red gram, sorghum, red gram, green gram, red gram and soybean cropping systems were ₹ 22513, ₹ 24659, ₹ 12507 and ₹ 13719, respectively. Returns per rupee of expenditure were found to be the highest in sorghum red gram cropping system.

Kumar *et al.* (2012) revealed that the net profit was only ₹ 3787/ha in lentil and ₹ 3719/ ha in pigeon pea, while black gram and chickpeas net profit was ₹ 3061/ha and ₹ 3034/ha, which was negative in monetary terms. The estimated benefit cost ratio of legumes was 0.74 in chickpea, 1.27 in lentil, 0.68 in black gram and 1.30 in pigeon pea. They estimated the cost benefit ratio from growing chickpea, lentil, black gram and pigeon pea on per hectare basis using recent prices.

Hedge *et al.*, (2013) estimated the cost of cultivation of black gram at ₹ 27, 671. It increased with the size of holding from ₹ 27,044 for small farmers to ₹ 28,307 for large farmers. It was observed that the operational costs accounted for a major share in the total costs on all the categories of farms. The total operational costs were ₹ 22,972, ₹ 24,057 and ₹ 23,493 for small farmers, large farmers and the sample as a whole respectively. Higher operational cost of large farmers was due to hiring more human labour and tractor services and incurring more cost on manures and fertilizers and plant protection chemicals.

Ahirwar *et al.*, (2015) revealed that the cost of cultivation was found to be highest on large farm (₹ 29379.88/ha) as compared to medium farm (₹ 26155.99/ha) and small farm (₹ 21942.80/ha). The gross income received from wheat cultivation was ₹ 50166.54 per hectare on overall farms, while gross income was found to be maximum in case of large farm (₹ 55817.55/ha) followed by medium farm (Rs. 50191.20/ha) and small farm (₹ 44490.87/ha). The net income, farm business income, family labour income and farm investment income were found to be ₹ 24340.32, ₹ 35779.93, ₹ 27969.70 and ₹ 34498.43 per hectare, respectively on overall farms. The cost benefit ratio was found to be highest on small farm (1:2.027) as compared to medium (1:1.918) and large farm (1:1.899).

Srivastava *et al.*, (2015) in their study observed that the total cost increased with the increase in the farm size along with net income, family labour income, farm business income and farm investment income. Output input ratio indicated that the return to every rupee of investment in soybean cultivation increased with increase in farm size.

Singh *et al.*, (2016) revealed that the per hectare cost  $C_2$  of cultivation of brinjal was ₹ 122019.23 on sample farms. The cost  $A_1$  constituted all direct cost and was ₹ 70413.74 per hectare on sample farms. The cost  $A_2$  was ₹ 81663.74/hectare and cost  $B_1$  was ₹72725.23/ hectare on the sampled farms. The cost  $B_2$  and cost  $C_1$  were constituted at ₹ 108659.23/hectare and ₹ 86085.23/hectare, respectively. The gross return was ₹ 264000/hectare on sampled farms. The net return was recorded at ₹ 141980.77 / hectare and the cost benefit ratio was 1:2.16.

Mazher Abbas *et al.* (2017) designed at Social Sciences Research Institute (PARC), AARI, Faisalabad during the year 2015. The objective was to calculate chickpea cost of production in Bhakkar and Layyah districts of low intensity zone and also to investigate the factors responsible for low chickpea yield in selected districts. A sample of 80 farmers was selected through purposive sampling technique and a well developed interview schedule was used for data collection. Chickpea cost of production was estimated at Rs. 13688 with the gross returns of at Rs. 19958. Net income received by the farmers was noted as Rs. 6270 showing benefit cost ratio of Rs. 1.00:1.50. The results of the regression model indicate that farming experience, seed cost, ploughing and

harvesting cost show significant effect on chickpea yield. The coefficient for experience, seed cost, ploughing cost and harvesting cost showed positive impact on yield indicating that 1 percent increase in these variables will bring 0.03, 0.44 and 0.85 percent increase in chickpea yield. The paper concluded that use of improved and high yielding seed along with better management practices like proper land preparation, weeding, etc. can help increase the per acre yield of chickpea in low intensity zone.

## **2.2 Production efficiency**

Production efficiency in agriculture means that production of the total stock that man can make available under technological and economic condition for cultivation practices. The quantum of production under a normal crop season is directly related to the availability of resource input and their techniques of application. Productivity, the output flow per unit of resource input, depends on the level of input used, which in turn depends upon the investment pattern.

Verma and Pareek (1975) studied resource use efficiency of pulses in Jaipur district and found higher marginal productivity of land on small farms as compared to that on large farms. The explanation given for this was that an effort to get more income from the limited area of land available the small farmers cultivated their land more intensively.

Kumar (1986) reported that there was a wide gap between potential and average yield of pulses throughout India. While most states had not achieved the national average figure, a few have shown good productivity for a particular crop although the area under pulse in these states was quite low.

Thombre *et al.* (2009) studied the resource productivity, resource use efficiency, and optimum resource use in black gram production. The result revealed that regression coefficient of area (0.665) was highly significant at 1% level while regression coefficient of machine labour (0.206) and seed (0.167) were positive and statistically significant at 5% level. Thus, it was inferred that these resources were underutilized and there was scope to increase them in black gram production. The ratios of MVP to price with respect to above resources were higher than unity.

Birachi *et al.* (2011) studied that a unit increase in the value of productive assets lead to 10 per cent increase in production of beans and increase in quantity produced lead to 30 per cent increase in marketed quantities, while reduction in transport losses resulted in 12 per cent increase in marketed quantities.

Reddy (2013) revealed that the inclusion of short duration varieties of pulses as catch crop like replacement of pigeon pea (late) with pigeon pea (early), introduction of black gram/ green gram (spring) will increase cropping intensity even up to 300%. Reducing storage losses and improving market information and infrastructure, linking MSP to market prices can bridge the gap between demand and supply development of market information systems for pulses and oilseeds, which are neglected traditionally.

Pawar *et al.*, (2014) revealed that, regression co-efficient of area under wheat was 0.263 followed by family human labour (0.182), machine labour (0.143) and irrigation (0.300) which were positively significant at one per cent level. Regression co-efficient of bullock labour, potash and plant protection were found significant at 5 per cent level. On the contrary, the regression co-efficient of hired human labour and nitrogen were negative and non-significant. Marginal product of area under wheat was 7.49 quintals followed by machine labour (0.42 q), bullock labour (0.24 q) and family human labour (0.23 q). MVP to price ratio with respect to area under wheat was 2.89 followed by that of family human labour (2.28), machine labour (1.62), irrigation (1.40) and phosphorous (1.36). Hence, preference might be given to increase the area under wheat production on priority basis. Optimum use of area under wheat was found to be 1.50 hectares.

Sharma (2014) on the basis of secondary data reported that the growing of pulse crops was not risky as revealed by lower CV. The CV of area, production and productivity of pulse crops were less than 0.08 per cent. The instability indices were positive and thereby indicating no risk for growing pulse crops in coming days. He also reported that the increase in production is due to increase in area as well as interaction of area and productivity of pulse crops in the study periods.

Karthick *et al.*, (2015) based on a study, reported that, bulbs, plant protection chemicals and human labour, machine hours, and phosphorous had a positive and significant influence on onion yield. Economic efficiencies were more than one for bulb, nitrogen, phosphorous, potash, plant protection chemicals, machine hours, land size values, farmyard manure and human labour in onion production which meant that these resources were used at suboptimum level and there lied a possibility of increasing the yield of onion by increasing their use. The technical efficiency for the farms was estimated at 78%, which indicated the possibility of increasing the yield of onion by adopting better technology. This study suggested that development of awareness of modern agricultural practices through demonstration, farm visits, framers meetings etc., by the government as well as removal all inputs distributional bottlenecks would ensure increased onion production in the study area.

Thakur and Rathi (2016) studied the resource use efficiency of chickpea production in Sagar district of Madhya Pradesh and reported that the value of coefficient of multiple determinations ( $R^2$ ) was found to be quite high in all farm size (93 to 98 per cent) which indicated that the selected form of the production function was best fitted. The return to scale is the sum of the elasticity of resource included in the power function, which indicates the behavior of change of total return while changing all the input simultaneously. The overall sum of the regression coefficient of selected variable was 0.75 which was 0.92 on small farm, 0.75 on medium farm and 0.45 on large farm indicating decreasing return to scale in small, medium and large farm. The value of coefficient of seed 0.20 and irrigation 0.15 in large and PPM 0.95 in medium farm were observed positive and highly significant.

### **2.3 Marketing structure and efficiency**

Acharya (1985b) examined price structure for pulse crops with reference to price behavior at farmer's level over time and across farm group, farm retail price spread and its components and sum structural characteristics of the market affecting the behaviour Rajasthan. The study revealed that the trend of farm harvest price of gram had shown an increase over time. The difference in prices received by the farmers of different groups was significant. Large farmers received higher price than small farmer. Those farmers

who sold in the villages did not receive a lower price than the price received by those selling in the regulated market price.

Sathihal *et al.* (1998) reported that only one marketing channel was observed in all the three markets viz., “Producer – Commission Agent cum wholesaler Retailers – Consumers”. The producer’s share in consumer’s rupee was the highest in Bijapur market (54.82 per cent), followed by Hubli (49.33 per cent) and Bangalore markets (48.11 per cent) in spite of receipt of lower net price of ₹ 487.92 by the producer in Bijapur market as compared to ₹ 505.65 and ₹ 553.27 per quintal received by the producer in Hubli and Bangalore markets respectively. It was also observed that producers were poorly organized and had many problems in marketing of their produce at remunerative prices. There is a need to develop proper marketing and processing facilities of its cultivation on large scale under dry land horticulture areas of Karnataka.

Singh *et al.* (2010) reported that marketing cost was most important for all categories of farmers. Producer’s share in consumer’s rupee was directly related to the channel of marketing. As the number of functionaries increases, the share of producer in the consumer’s rupees gets reduced.

Srivastava *et al.* (2010) studied that in the marketing of soybean the highest margin was charged by retailer. The lowest marketing cost incurred by the farmer in channel-II was due to the fact that in this channel minimum number of intermediaries was involved in the marketing of soybean. It was observed that the net margin of village merchant was 13.9 per cent in the case of channel-I. The wholesaler’s net margin was 4.7 and 6.2 per cent in channel-I and III. Processor’s net margin was 10.6, 12.0 and 12.2 per cent in channel-I, II and III. The marketing efficiency was estimated to be 2.18, 2.47 and 2.44 per cent for channel-I, II and III respectively. Highest marketing efficiency was observed in channel-II.

Singh *et al.*, (2012) found that marketed surplus increased with increase in size of farms and varied from 5.16 q in the first size group to 26.67 q for the large size group with an overall average of 11.57 q. The marketed surplus by different size of farms was worked out at 48.09, 58.20, 62.37 and 57.94 per cent of the total production for small,

medium, large and all farms, respectively. The percentage contribution by each size group of farms in total marketed surplus was 9.31, 26.88 and 53.81 per cent, respectively, for small, medium and large size of farms. The proportion of sale to total production was recorded at 48.09, 58.20, 62.37 and 57.94 per cent for small, medium, large and all farms, respectively.

Parshuramkar *et al.*, (2014) studied four marketing channels were selected for knowing the market price spread. The channels included Channel (I) – Producer-Consumer, Channel (II) –Producer–Miller-RetailerConsumer. Channel (III) –Producer-Village trader- Miller- Retailer- Consumer, Channel (IV) –Producer Wholesaler- Miller-Retailer-Consumer. Out of four-channels, producer's share in consumer's rupee was highest in case of channel (I) and it was 94.66 per cent. In channel (II) and channel (III), it was 53.05 and 53.90 per cent and in channel (IV), it was 51.87 per cent. It was concluded that the selling of produce in market by producer himself directly to the consumer was found to be most profitable. In marketing of paddy, non-remunerative price of paddy and high cost of transportation were identified to be the major problems, which need the immediate attention of the policy-makers.

Verma and Kumar (2015) found that small sized farmers disposed off their total surplus cumin seed in one lot. As against this medium and large sized farmer disposed off their total surplus in two and more lots. Two marketing channels were identified in the study area for marketing of cumin. Channel I: Producer – Village trader – Wholesaler-Retailer – Consumer. Channel II: Producer –Wholesaler- Retailer – Consumer. Among these channels, 75% quantity of cumin moved through channel –II and 25% quantity was moved through channel-I.

Raman and Umanath (2016)in their study, found the banana producers to follow three channels for marketing of banana; channel I: Producer - Pre harvest contractor - Commission agent – Retailer - Consumer; channel II: Producer - Wholesaler - Retailer - Consumer; channel III: Producer - Commission agent - Retailer - Consumer. The marketing cost was found to be higher when banana was sold through channel I due to commission charges, transport charges and loading and unloading charges contributing major proportion. The producer's share was computed at 59.06 per cent in channel II.

The study suggested that measures need to be adopted to increase access of farmers to market information and they should be educated to sell their produce in the regulated markets which can fetch higher returns as compared to village level marketing.

#### **2.4 Production and marketing constraints**

Mathur (1977) reported that about a dozen insects, including pod borers, stem borers, leaf miners, foliage caterpillars, jasside, aphid, and white flies were the most important constraints that affected the *kharif* pulses.

Saha *et al.* (1990) studied that the holding in general were small, segmented and scattered in different locations in more than one village. Much labour is wasted in the movement of inputs, implements and produce. Farmers have difficulty supervising all their plots efficiently. Consequently, average yield and net returns are low.

Kumar *et al.* (2010) studied that main constraints faced by pulse grower were non availability of HYV seeds, fertilizers, plant protection chemicals, low price of produce, lack of subsidy for inputs, lack of knowledge about seed rate, seed treatment, weed management dosage and methods of fertilizer application. They also concluded that the technology should be such that the farmers could get the net returns equivalent to that they get from the crops they mainly grow. Only then, will the farmers go for cultivation of pulses.

Sivagami *et al.* (2010) studied that the contractual arrangements reduced the risk in maize production and marketing. Analysis of price spread in the three marketing channels revealed that contract farmers share in consumer price was 85.71 per cent which was higher than the non-contract farmers. The results of the Garrett's ranking technique indicated that high preannounced price was the major factor that motivated the contract farmers. The inadequate loan was the major constraint faced by the contract farmers.

Sharma *et al.* (2013) studied the problems and opportunities of agricultural marketing in India. They found that the low yield of food and cash crops, fodder fuel and other minor forest produce and their stagnant growth affected the agrarian economy and in particular the household food security. The scattered land holdings, traditional mode of production, low use of modern inputs and lack of market incentives are the primary

causes of the poor performance of agriculture in J&K. increase in Seed Replacement Rate of major crops, popularization of hybrids, soil and water conservation measures and public private partnership are important aspects need to be considered for agricultural development in hilly areas of J&K.

Peer *et al.*, (2014) revealed that the major constraints for adoption of crop production technologies faced by the potato growers were complicated seed treatment technique (100.00%), non-availability of fertilizers at proper time (76%), financial problem (72.89%), non-availability of insecticides/ pesticides at proper time (64.64%), high cost of fertilizers (61.77%), high cost of seed (60.04%), high cost of fungicides (57.78%) and labour problem (54.66%).

Kumar *et al.*, (2015) revealed that more than 90% of respondents were not adopting land levelling, irrigation management, plant protection measures, seed treatment, and nutrient management due to various constraints such as lack of capital, high cost, lack of knowledge etc. Multiple regression analysis showed positive and significant impact of education on adoption of soybean production technologies.

Pathak *et al.* (2016) revealed that most important constraints faced by pulse growers in Durg district of Chhattisgarh were problem of insects, pests and diseases, lack of storage facilities, and lack of information regarding standardization and grading. Lack of awareness about market news and intelligence, shortage of labour, lack of technical knowledge, inadequate training of farmers and lack of financing at reasonable interest rate were some other important constraints in pulse production.

Pokharkar *et al.*, (2016) studied the process of marketing channels and observed producer - pre-harvest contractor -wholesaler - retailer - consumer to be the most popular channel. The channel wise per quintal cost of marketing was highest (₹ 286.34) for channel-I followed by channel-II (₹ 228.23) and channel-III (₹ 165.65). The channel wise price spread was worked out together with marketing margins for channel- I, II and III. The price paid by the consumer per quintal was highest (₹ 1199.26) in channel-I and lowest (₹ 557.71) in channel-III. The net price received by the producer was maximum in channel-I (₹ 514.66) and minimum in channel-III (₹ 398.26).

## **CHAPTER 3**

### **MATERIAL AND METHODS**

The present investigation entitled “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state” was carried out during the year 2017-18. This chapter deals with the methodology followed to accomplish the objectives of the study. The description of locale of the study, collection of the data, sampling design and structure and experimental procedure and techniques adopted during the course of investigation are discussed in this chapter.

#### **3.1 Locale of study**

The present study was confined to the Samba district of J&K state purposively as this district is a *Kandi* belt area having area (around 2819 ha) under pulse crops.

##### **3.1.1 Period of the study**

The reference period of this study was agriculture year 2016-17.

#### **3.2 Collection of data**

Both primary as well as secondary data were used as per the requirements of the study. The primary data were collected by survey method by interviewing the pulse growers directly through a pre-tested schedule. For Market Information, data were collected from the different intermediaries as well as markets involved in the marketing of pulses. The required secondary information related to area, production and marketing was collected from different sources/agencies.

#### **3.3 Sampling Design**

A multistage sampling technique was used for the present study.

##### **3.3.1 Sampling Structure**

###### **a) Selection of blocks**

As per the information available from Distt info. officer Samba, out of total 9 blocks falling in Samba district, Nud and Samba blocks were selected purposively at the first stage of sampling.

**b) Selection of villages**

At the second stage of sampling, 5 villages each from these two development blocks were selected randomly to constitute a total of 10 villages.

**c) Selection of farmers**

At the third stage of sampling, 12 farmers from each village were selected through random sampling technique without replacement to constitute a sample size of 120 farmers in total.

**3.4 Quantification of the variables**

The various inputs used in the production of major pulses (urd bean, moong bean and gram), along with various costs and returns concepts were quantified as follows:

**3.4.1 Human labour**

It included both hired and family labour. Human labour cost comprised of wages actually paid the hired labour and imputed value of labour put in by family members working on the Major Pulses (urd bean, moong bean and gram) farms.

**3.4.2 Manure & fertilizers**

This item included the expenditure incurred on the purchase of chemical fertilizers and farm yard manures used for the production of Major Pulses (urd bean, moong bean and gram) on the sample farms. The farm yard manure used at the farm was assessed at the prices prevailing in the study area. Similarly, the physical quantities of different fertilizers used were multiplied with the market price.

**3.4.3 Seed**

This item included the quantity of seed per hectare in kilograms at the farm for Major Pulse crop (urd bean, moong bean and gram) under study. Value of the seed produced on the farm was assessed at the prevailing market price (year 2016) to work out its cost of cultivation and value of seed which was purchased from the market was based on actual payments made for its purchase.

### **3.4.4 Plant protection**

The various plant protection chemicals used per hectare for *rajmash* were assessed. Charges actually paid by the farmers were calculated by multiplying the quantity of the various pesticides, insecticides, fungicides and herbicides with the market rates charged per unit of area item used.

### **3.4.5 Machine use**

Tractor was used on the farm to accomplish major agriculture operations, like preparatory tillage operations, sowing, transporting input and output from and to the farm etc. The expenditure incurred on the machine use was worked out by taking in to account the tractor hours used per hectare on any crop and the market rate at which tractor could be hired on customer basis.

### **3.4.6 Land revenue**

The land revenue actually paid by the farmers to the government was considered.

### **3.4.7 Depreciation**

The depreciation on the farms building, farms implements and machineries were considered at the rate of 12 per cent per annum which is similar to Choubey and Atteri (2000).

### **3.4.9 Rental value of land**

The rental value of land was calculated as the  $1/6^{\text{th}}$  of the gross produce value excluding the land revenue.

### **3.4.10 Variable cost**

It included expenditure made on human labour, seed, manure and fertilizers, plant protection chemicals, interest on working capital and miscellaneous charges.

### **3.4.11 Fixed costs**

It included expenditure made on various fixed components viz. rental value of owned land, depreciation on implements and farm buildings and interest on fixed capital.

### **3.4.12 Interest on working capital**

Interest on working capital was calculated at the rate of 12 per cent per annum for the period of six months.

### **3.4.13 Interest on fixed capital**

The value of total fixed assets was calculated and then 12 per cent per annum interest was considered as the total interest on fixed assets.

### **3.4.14 Gross returns**

Gross returns from Major Pulse crops (urd bean, moong bean and gram) per hectare was obtained by value of pulse grain. Prices of pulse grain used to arrive at gross returns was the post-harvest market prices in the study area.

### **3.4.15 Farm Business Income**

It is also known as profit at Cost A. It provides an estimate of returns to the farmer for his investment and profit. It was calculated as:

$$\text{Farm Business Income} = \text{Gross returns} - \text{Cost A}_2$$

### **3.4.16 Family Labour Income**

It is also known as profit at Cost B. It provides an estimate of returns to the farmer for his labour and profit. It was calculated as:

$$\text{Family Labour Income} = \text{Gross returns} - \text{Cost B}_2$$

### **3.4.17 Net Income/Returns**

It is also known as profit at Cost C. It provides an estimate of returns to the farmer for his labour and profit. It was calculated as:

$$\text{Family Labour Income} = \text{Gross returns} - \text{Cost C}_2$$

### **3.4.18 Return over variable cost**

Returns over variable cost per hectare from Major Pulse crops (urd bean, moong bean and gram) were obtained by subtracting the variable cost incurred per hectare for the gross returns per hectare of that crop.

### 3.4.19 Returns over fixed cost

Returns over fixed cost per hectare from Major Pulse crops (urd bean, moong bean and gram) were obtained by subtracting the fixed cost incurred per hectare for the gross returns per hectare of that crop.

### 3.4.20 Cost Benefit Ratio (return per rupee)

It was calculated as:

$$\text{B: C Ratio} = \text{Gross Income} / \text{Cost } C_2$$

## 3.5 Economic Analysis

### 3.5.1 Cost and returns

Suitable statistical tools and techniques were utilized for analysis of data to achieve the objectives of the study.

For computation of costs and returns, the concepts framed by CACP were used like Cost A, B, C etc.

Cost A<sub>1</sub> = Expenditure on casual labour, farm machinery, seeds, fertilizer and manure, plant protection chemicals, miscellaneous expenditure (cost of transportation, baskets and ropes) and interest on working capital + depreciation + land revenue.

Cost A<sub>2</sub> = Cost A<sub>1</sub> + rent paid for leased-in land.

Cost B<sub>1</sub> = Cost A<sub>1</sub> + interest on value of owned fixed capital excluding land.

Cost B<sub>2</sub> = Cost B<sub>1</sub> + rental value of owned land (net of land revenue) + rent paid for leased-in land.

Cost C<sub>1</sub> = Cost B<sub>1</sub> + imputed value of family labour.

Cost C<sub>2</sub> = Cost B<sub>2</sub> + imputed value of family labour.

Cost C<sub>3</sub> = Cost C<sub>2</sub> + 10 per cent of cost C<sub>2</sub> on account of managerial function performed by the farmer.

### 3.5.2 Production Efficiency

The fitted Cobb-Douglas production function written for the present case with five input variables as:

$$\text{Est. } Y = a_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} \dots X_5^{b_5}$$

Where,

Y represents Gross returns (₹/ha)

X<sub>1</sub> represents Human labour (₹/ha)

X<sub>2</sub> represents Machine labour (₹/ha)

X<sub>3</sub> represents Cost of Seed (₹/ha)

X<sub>4</sub> represents Manure & fertilizers (₹/ha)

X<sub>5</sub> represents Plant protection chemicals (₹/ha)

b<sub>1</sub>... b<sub>5</sub> are estimated regression coefficients.

The productivity of different inputs used in Major Pulse crops (urd bean, moong bean and gram) production was examined by calculating marginal value productivities of inputs which was estimated at geometric mean level of inputs.

$$\text{MVP } (X_i) = b_i \frac{Y(\text{G.M.})}{X_i(\text{G.M.})}$$

Where,

MVP (X<sub>i</sub>) is the marginal value productivity of i<sup>th</sup> resources

b<sub>i</sub> is the regression Coefficient (estimated)

GM (Y) is the Geometric Mean of Output (yield)

GM (X<sub>i</sub>) is the Geometric Mean of i<sup>th</sup> resources.

### 3.5.3 Marketing Efficiency

For estimation of Marketing Efficiency (ME), Acharya and Agarwal approach (2001) was used. The modified marketing efficiency (ME) formula is given as:

$$ME = \frac{NVP_F}{MM + MC + ML}$$

Where,

$NP_F$  is the net price received by the farmers

MM is the marketing margin

MC is the marketing cost and

ML is the marketing loss.

#### Marketing margin

Marketing margin of middlemen was calculated as the difference between the total payment (marketing cost + purchase price) and receipts (sale price) of the middlemen and was calculated as;

$$A_{mi} = P_{ri} - (P_{pi} + C_{mi})$$

Where,

$A_{mi}$  is the absolute marketing margin of  $i^{\text{th}}$  middlemen

$P_{ri}$  is the total value of receipts per unit

$P_{pi}$  is the purchase value per unit

$C_{mi}$  is the cost incurred on marketing per unit.

#### Marketing cost

The total marketing cost (MC) incurred by the producer / seller and by various intermediaries was calculated as:

$$MC = C_F + C_W + C_R$$

Where,

MC is the marketing cost

$C_F$  is the cost incurred by farmer

$C_W$  is the cost incurred by wholesaler and

$C_R$  is the cost incurred by retailer.

### **Marketing Loss**

The loss in the total value of produce due to injury/damage caused during handling of produce from the point of harvest till it reached the consumers was estimated as per equation:

$$ML = \{L_F \times GP_F\} + \{L_W \times GP_W\} + \{L_R \times GP_R\}$$

#### **3.5.4 Production and marketing constraints**

The selected sample farms were contracted through survey for analyzing the constraints faced by them at various levels. Thereafter, the information on different aspects of production and marketing constraints faced by the farms was tabulated, analyzed and interpreted. Individual aspect-wise constraints of pulse growers were worked out. The intensity of constraints was measured on a three point continuum scale. Weight of 3, 2 and 1 were given for most important, important and least important constraint, respectively. Total score obtained by each respondent as well as for each statement was calculated. Finally mean percent score (MPS) was calculated by the following formula.

$$\text{Mean percent score} = \frac{\text{Total score obtained}}{\text{Maximum obtainable score}} \times 100$$

**MATERIALS AND  
METHODS**

## CHAPTER – III

### MATERIALS AND METHODS

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The present study entitled “Genetic Variability and Drought Index Analysis in Indian Mustard (*Brassica juncea* L)” was carried out at the experimental farm of Division of Plant Breeding and Genetics, SKUAST-J, F.O.A Chatha during *Rabi* season 2017-18.

#### 3.1 Experimental material

The seed material of 20 genotypes of *Brassica juncea* species was procured from different institutes of India including SKUAST-Jammu. The experimental material was grown in a Randomized Blocked Design with 3 replications under irrigated and rainfed conditions. Each treatment was sown in 3 rows of 5 m length. The inter and intra row spacing was 30 cm and 15 cm, respectively. The recommended dose of fertilizers was applied and also the recommended Plant Protection measures were adapted for raising a good crop. All the genotypes with their pedigree and source are enlisted in Table 1.

**Table 1: Genotypes with their pedigree used for study**

S. No	Genotypes	Pedigree	Source
1	RH-1209	RH-0555 X RH-O401B	CCSHAU, Hissar
2	DRMRIJ-15-85	(EC 39288 XPCR 11)X (B33X Sanjucta Asch)	DRMR, Bharatpur
3	DRMRIJ-15-5	Choupka x PWR	DRMR, Bharatpur
4	RGN-385	RL 99-27 X RGN-73	ARS, Ganganagar
5	RB-77	RH-819 X RH-8814	CCSHAU, Bawal
6	RLJEB-84	( <i>B. juncea</i> x <i>Diplotaxis erucoides</i> ) x <i>B. juncea</i>	PAU, Ludhiana
7	Kranti	Selection from Varuna	CSAUA&T, Kanpur
8	Varuna	Selection from Varanasi local 786,02.021976	CSAUA&T Kanpur
9	RSPR-69	RLM 198 X Varuna	SKUAST-Jammu
10	RH-749	RH-781 X RH-7617	CCSHAU, Hissar
11	RH-406	-	CCSHAU, Hissar
12	NPJ-183	(NPJ-102 X Pusa jaganath) x NPJ-102	IARI, Delhi
13	Giriraj	HB-9908 X HB-9916	DRMR, Bharatpur
14	RB-50	Laxmi x RH-9617	RRS, Bawal
15	RB-55	-	RRS, Bawal
16	NRCHB-101	BL4 X Pusa Bold	DRMR, Bharatpur
17	Pusa Bold	Varuna x BIC 1780	IARI, Delhi
18	RH-819	Prakash x Bulk Pollen	CCSHAU, Hissar
19	DRMRIJ-541-44	-	DRMR, Bharatpur
20	DRMRIJ-59	-	DRMR, Bharatpur

### 3.2 Experimental observations

Five plants were randomly selected from each treatment in each replication for recording the observations. These plants were tagged and detailed observations were recorded on the following traits:

#### 3.2.1 Days to 50% flowering

Number of days taken from date of sowing to the date of 50% of flowering in the row was recorded.

#### 3.2.2 Days to maturity

Days to maturity was recorded as the days taken for completion of physiological maturity in 90 per cent plants in a plot.

### **3.2.3 Plant height (cm)**

The plant height was measured from ground level to the tip of plant of ten randomly selected plants in cm from each plot and averaged.

### **3.2.4 Primary branches per plant**

The number of primary branches arising from the main shoot were counted in ten randomly selected plants in a plot and averaged

### **3.2.5 Number of secondary branches per plant**

Number of secondary branches was observed as the number of effective branches arise from the primary branches.

### **3.3.6 Number of siliqua per plant**

Number of siliqua per plant from each sampled plant was counted .

### **3.2.7 Number of seeds per siliqua**

The total number of seeds from the siliqua of each sampled plant was recorded at maturity.

### **3.2.8 Length of siliqua (cm)**

The length of selected siliqua was measured excluding pedicel and beak portion.

### **3.2.9 Number of seeds per siliqua**

The number of siliqua per plant were recorded by counting total number of siliqua on ten randomly selected plants in a plot and then averaged.

### **3.2.10 Test weight (g)**

From the produce of each sampled plant, 1000-grains were counted and weighed in grams with the help of electric balance.

### 3.2.11 Oil content (%)

Oil content was estimated in percent by using Nuclear Magnetic Resonance (NMR) technique.

### 3.2.11 Seed yield per plant (g)

The seeds from five randomly tagged plants were weighed and average seed yield per plant was calculated.

### 3.2.12 Root length (cm)

The root length measured from below to the surface.

### 3.2.13 Harvest index (%)

It is the ratio of seed yield to the total biological yield per plant expressed in percentage.

$$\text{Harvest index (HI)} = \frac{\text{Total seed yield/plant (g)}}{\text{Total biological yield/plant (g)}} \times 100$$

## 3.3 Statistical method

Statistical analysis such as correlation, coefficients of variability, heritability, genetic advance and path analysis was done using Statistical Analysis System (SAS) Software version 9.3.

### 3.3.1 Analysis of variance

In all the experiment the mean values of the genotypes in each replication were used for analysis of variance for all characters studied, according to analysis of variance utilized in the R.B.D. the following model was utilized in the analysis of this design.

$$Y_{ij} = U + b_i + t_j + e_{ij}$$

Where,

$$Y_{ij} = \text{performance of } j^{\text{th}} \text{ strains /variety in } i^{\text{th}} \text{ block}$$

$$(i = 1, 2, \dots, r; j = 1, 2, \dots, v).$$

U = general mean

$b_i$  = affect of  $i^{\text{th}}$  block

$t_j$  = effect of  $j^{\text{th}}$  strain/variety, and

$e_{ij}$  = random error

Restrictions are  $\sum_{i=1}^r b_i = 0$  and  $\sum_{j=1}^r t_j = 0$

The splitting of total variance into variance due to replications, treatments and error and their expectations are given in the following table. The significance at  $(t-1)$  and  $(r-1)$  ( $\pm 1$ ) degrees of freedom, wherever, the 'P' value was found to be significant; comparison was further extended by testing the difference of any two means against critical difference (C.D) at 5 and 1 percent levels of significance, standard error of the differences ( $S_{\bar{d}}$ ) between two treatment means and critical differences (CD) were calculated as follows:

$$S_{\bar{d}} = \sqrt{\frac{2 \text{ E.M.S}}{r}}$$

Where,

E.M.S. = Error mean squares

C.D. =  $S_{\bar{d}}$  x t value at error d.f. at 5% and 1% probability level

**3.3.2** The analysis of variance for various characters studied in experiments was carried out according to the analysis of variance for R.B.D.

## Analysis of Variance

Sources of variations	d.f	Mean squares variances	
		Observed	Expected
Replications	(r-1)	$M_r$	
Treatments	(t-1)	$M_v$	$\sigma^2 e_{ii} + r\sigma_{ii}^2$
Error	(r-1)(t-1)	$M_e$	$\sigma^2 e_{ii}$

where,

$\sigma^2 e_{ii}$  and  $\sigma^2 g_{iii}$  are environmental and genotypic variances of  $i^{\text{th}}$  character, respectively.

### Components of variance

- i. This was calculated by the formula suggested by Burton and De Vane (1953).

$$\text{Phenotypic variance } (\sigma_p^2) = (\sigma_g^2) + (\sigma_e^2)$$

Where,  $(\sigma_e^2)$  = error variances = E.M.S.

- ii. genotypic variance  $(\sigma_g^2)$

$$= \sigma_g^2 = \frac{M_v - M_e}{r}$$

Where,

$M_v$  = treatment mean squares

$M_e$  = error mean squares

r=no. of replications

### 3.4 Biometrical analysis

#### 3.4.1 Coefficients of variability

This was calculated by the formula suggested by Burton and De Vane (1953).

Phenotypic coefficient of variability (P.C.V):

$$\text{P.C.V (\%)} = \frac{\sqrt{\sigma_p^2}}{\bar{X}} \times 100$$

Genotypic coefficients of variability (G.C.V):

$$\text{G.C.V (\%)} = \frac{\sqrt{\sigma_g^2}}{\bar{X}} \times 100$$

Where,  $\bar{X}$  is the general mean of the character.

#### 3.4.2 Heritability

Heritability was calculated according to Singh & Ceccarelli (1996).

$$h^2 = \frac{\sigma_g^2}{\sigma_g^2 + \sigma_e^2} \text{ or } \frac{\sigma_g^2}{\sigma_p^2}$$

#### 3.4.3 Genetic advance

Genetic advance was also estimated according to Allard (1960).

$$\text{GA} = (K) (h^2) (\sqrt{\sigma_p^2})$$

Where, 'k' is selection differential and at 5% the K value was 2.06.

Genetic advance as per cent of mean (G.A.%):

$$\text{G.A. \%} = \frac{\text{Genetic advance}}{\bar{X}} \times 100$$

#### 3.4.4 Correlation coefficients

The simple correlation coefficients between different characters at genotypic and phenotypic level was worked out between characters as suggested by al- Jibouriet *al.* (1958).

- i. Phenotypic correlation coefficients ( $r_p$ )

$$r_p = \frac{\text{cov.XY(p)}}{\sqrt{\text{Var.X(p)}. \text{Var. Y(p)}}}$$

- ii. Genotypic correlation coefficients( $r_g$ )

$$r_g = \frac{\text{Cov.XY(g)}}{\sqrt{\text{Var.X(g)}. \text{Var. Y(g)}}}$$

Where,

Cor. XY(p) and cov. XY (g) denote phenotypic and genotypic covariances between character X and Y, respectively.

Var. X (p) and var. X(g) denote variance for characters X and Y, at phenotypic and genotypic levels, respectively.

The significance of different correlation coefficients was tested against (v-2) degrees of freedom at 5% and 1%, where v is the no. of varieties on which the observations were recorded.

### 3.4.5 Path coefficient analysis

The path coefficient was done following the procedure outlined by Dewey and Lu (1959) using genotypic correlation of 'cause' with 'effects' was calculated by following simultaneous equations:

$$r_{mp} = p_{mp} + r_{mnp} + r_{mop} \quad \dots 1$$

$$r_{np} = r_{nmp} + p_{np} + r_{nop} \quad \dots 2$$

$$r_{op} = r_{omp} + r_{onp} + p_{op} \quad \dots 3$$

where,

Pmp, Pnp, Pop are direct affects of m, n and o on cause P, and rmp, pnp, rmo, Pop... are indirect affects on cause. These simultaneous equations are solved by using matrix method expressed below:

$$\begin{array}{cccccc}
 \text{rmp} & & \text{rmp} & \text{rmn} & \text{rmo} & \text{Pmp} \\
 \text{rnp} & = & \text{rnm} & \text{rnn} & \text{rno} & \text{Pnp} \\
 \text{rop} & & \text{rom} & \text{ron} & \text{roo} & \text{Pop}
 \end{array}$$

or  $A = B.C$ . Here, A and B vectors are known. For calculation of C vectors, the formula used is:

$$C = B^{-1}, A$$

Here,  $B^{-1}$  is the inverse matrix of B vector. Pivotal condensation method was used for matrix inversion.

Work regarding the study of polymorphism among *Brassica juncea* genotypes using SSR markers was carried out at Molecular Biology Laboratory of the division of Plant Breeding and Genetics, Sher-e-Kashmir University of Agricultural Sciences and Technology – Jammu, Chatha. Materials and Methods used for conducting experiments are elucidated under the following headings:

### 3.5 Methods

#### 3.5.1 Genomic DNA Isolation

#### 3.5.2 DNA Quantification

#### 3.5.3 SSR assay

##### 3.5.3.1 Primers used for DNA amplification

##### 3.5.3.2 Components used for PCR reaction

##### 3.5.3.3 PCR amplification program

##### 3.5.3.4 SSR-PCR Banding Profile

#### 3.5.4 Scoring of Bands

#### 3.5.5 Diversity Analysis

### 3.6 Reagents and Solutions

### 3.5 Methods

### **3.5.1 Genomic DNA Isolation**

The genomic DNA isolation for each genotype was carried out by Doyle and Doyle, (1990) method. About 7-8cm young and actively growing fresh leaves were harvested from the field for genomic DNA extraction. 1ml of extraction buffer was poured in 2ml Eppendorf tubes and incubated at 65<sup>0</sup>C in the water bath. Fresh leaf material was taken and grinded to fine powder in liquid N<sub>2</sub> using pestle and mortar. The powdered material was transferred to 1ml of pre-warmed extraction buffer and incubated for 35 minutes with occasional stirring. An equal volume of Chloroform: Isoamylalcohol (24:1) was added to the tube and slowly tilted mixed by inverting the tubes for 10 minutes. The samples were centrifuged for 15 minutes at 8,000 rpm. The supernatant was then transferred to another tube and again treated with Chloroform: Isoamylalcohol (24:1), mixed slowly for 10 minutes for and centrifugation was done. To the supernatant, 0.6 volume of ice-cold Isopropanol was added and stored at 4<sup>0</sup>C for 1-2 hours. Centrifugation was done at 10,000 rpm for 10 minutes at 4<sup>0</sup>C. The supernatant was discarded and the pellets were washed with 0.01 M ammonium acetate (200µl -300µl) to remove contamination. 0.6 volume of Iso-propanol was added for precipitation and centrifugation was done at 5,000 rpm for 10 minutes. The pellet was washed with 70% ethanol and air dried. DNA was dissolved in 300µl TE Buffer and stored at 4<sup>0</sup>C. For purification of DNA, 300µl of RNase (10mg/ml) was added to the samples and incubated for 1 hour at 37<sup>0</sup>C in water bath. An equal volume of Phenol: Chloroform: Isoamylalcohol (25:24:1) was added, tilted for 10 minutes and centrifuged at 10,000 rpm for 10 minutes. To the supernatant collected in another tube, 0.6 volume of chilled iso-propanol was added and centrifugation was done to get pellet. DNA pellet was washed with 70 % ethanol, air dried, dissolved in TE (Tris-cl, EDTA) buffer and stored at 4<sup>0</sup>C for further use.

### **3.5.2 DNA Quantification**

Quality and quantity of genomic DNA was estimated by using Agarose gel electrophoresis and UV Spectrophotometric method.

#### **3.5.2.1 Agarose gel electrophoresis:**

DNA of all genotypes was quantified by loading 5µl of DNA of each genotype mixed with 3µl of loading buffer (6X) and 10µl of ddH<sub>2</sub>O into separate wells on 1% agarose gel. It was prepared by melting 1 g agarose in 100 ml TBE (Tris, Borate EDTA, 1X) buffer in a microwave for 2 minutes. It was allowed to cool for a couple of minutes and then stained with ethidium bromide and stirred for some time. The gel material was then poured in the casting tray with combs in it and allowed to solidify for 20 – 25 minutes at room temperature. DNA concentration standards were also loaded to estimate the concentration of DNA in each sample. The electrophoresis was carried out at 75V for 1 hour. It was then viewed under Biometra gel documentation system. The concentration of DNA was determined by comparing its intensity of bands with that of 100 bp molecular ladder quality was indicated by having intact band.

### **3.5.2.2 UV Spectrophotometric method**

Optical density of DNA samples was measured at 260nm and 280nm using spectrophotometer (Peq-Lab Nanodrop).

- a) Estimation of DNA concentration in different samples was done as follows:

$$\text{Concentration of DNA } (\mu\text{g/ml}) = \text{OD}_{260} \times 50 \times \text{Dilution factor.}$$

- b) Quality analysis was done by calculating the ratio of absorption maxima at 260nm and 280nm.

Ratio between 1.8 and 2.0 shows the presence of fairly pure DNA. The value less than 1.8 indicates the presence of protein contaminants and greater value than 1.8 indicates the presence of RNA. DNA samples were diluted using sterilized Milli Q water, to have final concentration of 25ng/µl.

### **3.5.3 SSR Assay**

#### **3.5.3.1 Primers used for DNA Amplification**

A set of 10 SSR markers were selected for use in amplification of genomic DNA. Based on earlier studies, SSR's were selected. These were got synthesized from IDT (Integrated DNA Technologies, USA).

**Table 2: 10 SSR markers with their each two sequences selected for DNA amplification**

S. No.	Markers	Sequences	Primer sequence 5'-----3'	Annealing Temp (°C)	Estimated product size (bp)	Repeat motifes
1	SSR Na10-B04	Forward	GCGTCGAGAGAGATCGAGAG	52	260-262	GA(40)
		Reverse	CTCACCGTCACTGCTTCATC			
2	SSR Na12-D03	Forward	GGTAAGCCAAAAACCCTTCC	50	115-120	GA(28)
		Reverse	GGTAAGCCAAAAACCCTTCC			
3	SSR Na12-H09	Forward	AGGCGTCTATCTCGAAATGC	48	250-255	GA(24)
		Reverse	CGTTTTTCAGAATCTCGTTGC			
4	SSR Na14-D09	Forward	GATCAACGTAAGGTCGCCTC	48	250-260	GA(24)
		Reverse	GAATCCAACGGATCAGAAGC			
5	SSR Na14-G06	Forward	AAACGGCTTGCATTGTTCTC	48	110-120	GT(9)
		Reverse	GGCTTGCTTGATCCAGTCTC			
6	Ni4-F11	Forward	CGTAAGTTTCAATTGTCAACGG	53	160-170	GA(45)
		Reverse	TCGTACGAAACAATCAACGG			
7	A01_2688930	Forward	CAATGTAATGGGAAGAAAATG	51	176	AT(11)
		Reverse	GTACCTCTCCTGGTCCTGTAT			
8	A02_18870790	Forward	TACACCGTCTGATTCCATCT	50	156	GGT(5)
		Reverse	GCCTGACTGCTGCTACTAAC			
9	A03_25410649	Forward	ATAGCCATACGCTGAAGAAA	51	150	TTG(5)
		Reverse	GAGACGAATAATCCTCCAAAT			
10	Aa05_15183336	Forward	GTTACCTATGAGCTCTCCTT	52	150	AT(7)
		Reverse	CGTGCGGGTATTTATTTTAT			

Source- (Lowe *et al.* 2000 and 2003) and( Neha *et al.* 2014).

### 3.5.3.2 Components used for PCR Reaction

DNA amplification was carried out in PCR tubes containing 25  $\mu\text{l}$  reaction mixture. Reaction mixture contained 2.5  $\mu\text{l}$  of template DNA (25ng/ $\mu\text{l}$ ), 2.5  $\mu\text{l}$  of 10X PCR Buffer,  $\text{MgCl}_2$  (2mM), 0.2 mM of each dNTPs (dTTPs, dGTPs, dCTPs, dATPs), primer (1.67Mm) concentration, 5 units Taq DNA polymerase. The quantity of these components used in a reaction is given in Table 3.

**Table 3: Reagents with their concentration and quantity used for single PCR reaction**

S.No.	Reagents	Concentration	Quantity
1.	Template DNA	25 ng/ $\mu\text{l}$	2.5 $\mu\text{l}$
2.	Sterile water		13.5 $\mu\text{l}$
3.	PCR Buffer	10 X	2.5 $\mu\text{l}$
4.	$\text{MgCl}_2$	50 mM/ $\mu\text{l}$	1 $\mu\text{l}$
5.	dNTPs	2.5 mM/ $\mu\text{l}$	2 $\mu\text{l}$
6.	Primer	5 $\mu\text{mole}$	3 $\mu\text{l}$
7.	Taq polymerase	5 U/ $\mu\text{l}$	0.5 $\mu\text{l}$
	<b>Total</b>		<b>25 <math>\mu\text{l}</math></b>

### 3.5.3.3 PCR Amplification Programme

PCR tubes containing master mix and DNA template were thoroughly mixed and subjected to the thermal profile given in table 6. The amplification reaction was carried out in a gradient mastercycler. An initial denaturation step of 4 minutes was programmed in the thermocycler, followed by a loop of 35 cycles each consisting of denaturation (at 94<sup>0</sup>C for 1 minute), annealing (at 36<sup>0</sup>C for 1 minute) and extension (at 72<sup>0</sup>C for 2 minutes). The final extension was performed at 72<sup>0</sup>C for 10 minutes. The PCR products were then stored at 4<sup>0</sup>C.

**Table 4: Thermal profiles used for DNA amplification**

Steps	Cycles	Temperature	Duration
Initial Denaturation	1	94 <sup>0</sup> C	4 min
Denaturation	35	94 <sup>0</sup> C	1 min
Annealing		48-53 <sup>0</sup> C	1 min
Extension		72 <sup>0</sup> C	2 min
Final Extension	1	72 <sup>0</sup> C	10 min

The same reaction mixture without genomic DNA was run for each reaction to serve as a negative control.

#### 3.5.3.4 SSR-PCR banding Profile

The amplification products were then subjected to electrophoretic separation using horizontal agarose gel electrophoresis. 2.5 % agarose gel was prepared in 1X TBE buffer stained with ethidium bromide. In each PCR tube, 7 µl of loading dye was added and then loaded to separate wells. 100bp DNA ladder was used as a molecular weight marker for determining the molecular weights of SSR based PCR bands. Electrophoresis was carried out at 60 V for 3 hours. The gel was visually examined under UV and documented using gel documentation system.

#### Scoring of Bands

SSR-PCR bands were detected in the gel using gel documentation system. Bands were seen for their presence (1) or absence (0). All the scorable bands were considered as single locus/allele. Their sizes were estimated using 100bp standard marker. The presence and absence of bands in all genotypes for 10 primers were used to generate Binomial data using excel sheet. Bands were marked as present only if the DNA amplification produced the fragment of a particular sequence and absent if the DNA amplification lacked that fragment. The banding patterns of all genotypes against each primer were compared. Bands present in one genotype and absent in another genotype, were regarded as variable and used to score for polymorphism. In order to check the informativeness and discriminatory power of SSR primers utilized in this study, certain

parameters like polymorphism percentage, polymorphic information content, resolving power and marker index were calculated.

**(a) Polymorphism (%)**

It was calculated by dividing the polymorphic bands by the total number of scored bands:

$$\frac{\text{Number of Polymorphic Bands}}{\text{Total Number of Bands}} \times 100$$

**(b) Polymorphism Information Content (PIC)**

Bi-nomial data matrix of all genotypes generated from 10 primers was subjected to the UPGMA (un-weighted pair group method with arithmetic averages) analysis and a dendrogram was constructed using DARwin 5.0 software. Genotypes were divided in various clusters, sub-cluster and sub-sub clusters based on genetic diversity among them and linkage distance was calculated.

### **3.6 Reagents and Solutions**

#### **3.6.1 Reagents**

**(a) Primers:** Arbitrary decamer primers were got synthesized from IDT (Integrated DNA Technologies, USA).

**(b) dNTPs: (dATPs/ dCTPs /dGTPs /dTTPs)**

100 mM stock of each dNTP was diluted to 2.5 mM of dNTP

(i.e., 25µl of each d NTP + 900µl of sterile water).

**(c) PCR buffer 10 X**

#### **3.6.2 Stock solutions**

**(A) Preparation of Stock Solutions (500ml) for DNA extraction**

- a) **0.5 M EDTA**      93.05 g
- b) **1 M Tris-cl**      60.55 g
- c) **5 M Nacl**          146.1 g

The pH of 0.5 M EDTA and 1 M Tris-cl was adjusted to 8.0. The solutions were autoclaved after making the final volume upto 500ml.

**d) CTAB Buffer**

0.5 M EDTA	20ml
1 M Tris-cl	50ml
5 M Nacl	140ml
TAB Powder	10g
ddH <sub>2</sub> O	
<i>β</i> - mercaptoethanol	0.2%

The final volume of CTAB buffer was made up to 500ml using ddH<sub>2</sub>O. It was then autoclaved after adjusting the pH to 8.0. *β*- mercaptoethanol (0.2%) was added immediately before use.

**e) 0.01 M Ammonium Acetate**

**f) TE Buffer (10X)**

1 M Tris-cl	100ml
0.5 M EDTA	20ml

880ml ddH<sub>2</sub>O was added to make 1L TE Buffer. pH was adjusted to 8.0 and autoclaved.

**g) RNase (10mg/ml) – 10ml**

5 M Nacl	30 $\mu$ l
1 M Tris-cl	100 $\mu$ l
ddH <sub>2</sub> O	9870 $\mu$ l
RNase	10mg

The solutions were boiled for 15 minutes, allowed to cool at room temperature and stored at 4<sup>0</sup>C.

**(B) Preparation of Stock Solutions for electrophoresis****a) Preparation of Buffers****1. TBE Buffer (10 X)**

Tris Base	108g
Boric acid	55g
0.5 M EDTA (pH 8)	40ml

Double distilled water was used to make the final volume upto 1L, mixed with the help of magnetic stirrer and autoclaved.

**2. Tank Buffer (1X TBE)**

100 ml 10X TBE was dissolved in 900 ml double distilled water.

**3. DNA loading Buffer (6X)**

Glycerol	30 % (v/v)
Bromophenol Blue	0.25 % (w/v)
Xylene cyanol	0.25 % (w/v)

**Drought Susceptibility Index (DSI)**

Drought Susceptibility Index (Fischer & Maurer, 1978) was used to characterize each genotype in the stress environment. The index was calculated using in the following formula.

$DSI = [1 - (YD/YP) / D]$  Where,

YD = mean seed yield in the stress environment

YP = mean seed yield in the non stress environment, Potential yield, and

D = Environment stress intensity =  $1 - (\text{mean YD of all genotypes} / \text{mean of YP all genotypes})$ .

# RESULTS

## CHAPTER 4

### RESULTS

This chapter includes the results pertaining to the present investigation entitled, “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state”. The outcomes of this study yielded many useful findings regarding production & marketing performance and constraints in major Pulses (urd bean moong bean and gram) of sampled farms of study area. For the sake of convenience, the present chapter has been discussed under the following sub heads:

- 4.1 Costs and returns
- 4.2 Resource use efficiency
- 4.3 Marketing structure and efficiency
- 4.4 Major constraints

#### **4.1 Costs and returns**

The cost of cultivation and the returns to different factors of production helps in decision making about the selection of an enterprise. Hence, different components of cost of cultivation, cost structure, cost concepts, gross returns and net returns from major pulse crops (urd bean, moong bean and gram) on selected farms under study area were worked out and presented in Table 4.1, 4.2, 4.3, and 4.4.

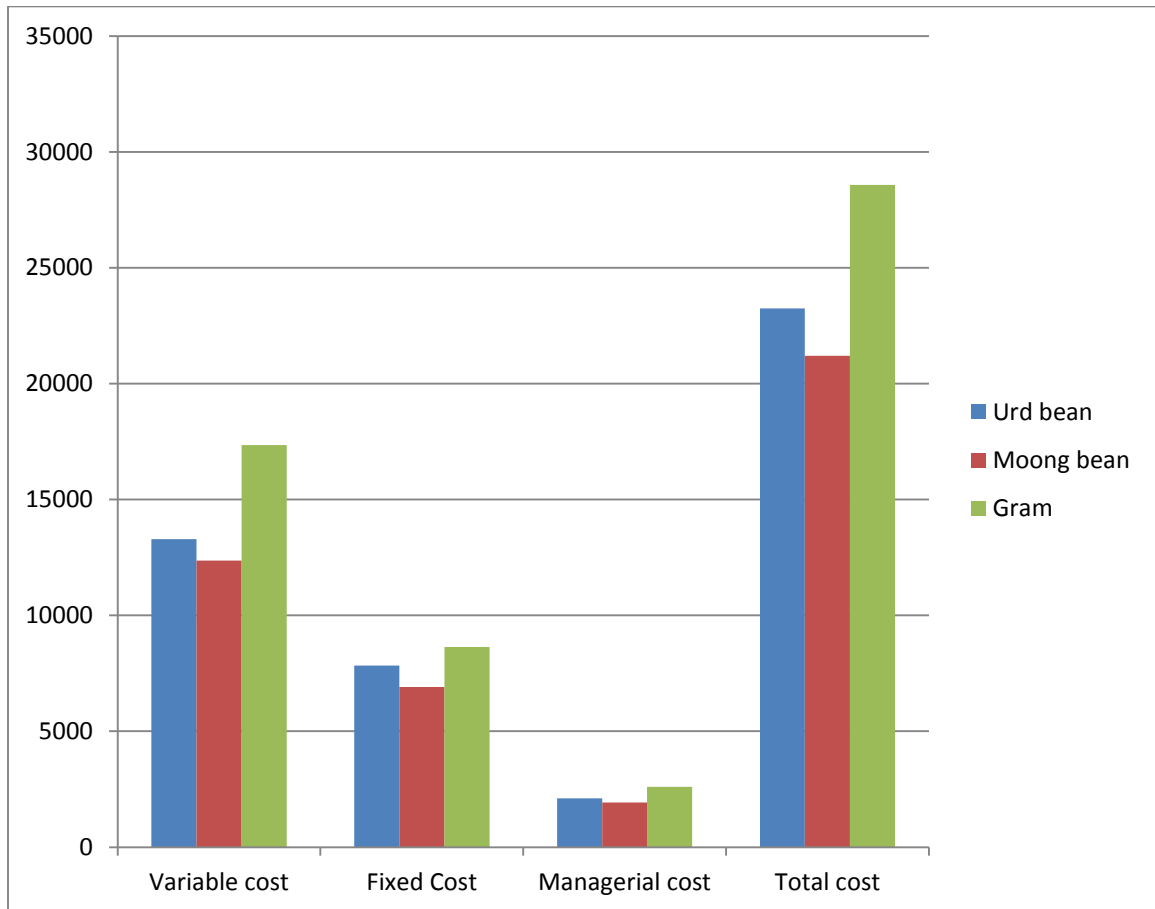
##### **4.1.1 Cost structure for major pulse crops**

The cost structure of major pulse crops have been presented in Table 4.1. Expenditure on hired labour, family labour, machine labour, seed, manure and fertilizers, plant protection chemicals were the important components of operational cost. Similarly, rental value of owned land, interest on fixed capital (excluding land) and depreciation on implements and farm buildings were the major components of fixed cost.

**Table 4.1. Cost of cultivation of major pulses of sample farms under study area according to cost structure (₹/ha.)**

Items		Urd bean	Moong bean	Gram
<b>A. Variable Cost</b>				
Human labour	Family	3727.57	3437.45	3865.37
	Hired	1407.18	1260.48	1742.24
	Total	5134.75	4697.93	5607.61
Machine labour		2812.87	2812.87	2812.87
Seed		1284.16	1250.20	4138.20
Fertilizer		1804.86	1460.26	1286.78
Plant protection chemicals		1105.59	1080.74	1914.32
Interest on working capital		728.53	678.12	945.59
Miscellaneous Expenditure		418.20	387.60	643.19
<b>Total variable Cost (A)</b>		13288.96	12367.72	17348.56
<b>B. Fixed Cost</b>				
Imputed rental value of owned land		5350.00	4604.17	5824.00
Depreciation on implements and farm building		1894.34	1760.56	2167.72
Land revenue		150.00	150.00	150.00
Imputed interest on fixed capital (excluding land)		443.66	390.88	488.50
<b>Total fixed cost (B)</b>		7838.00	6905.61	8630.22
<b>C. Managerial Cost</b>				
Managerial Charges (10% on VC & FC)		2112.70	1927.33	2597.88
<b>Total Cost (A+B+C)</b>		23239.66	21200.66	28576.66

The results in the Table 4.1 revealed that the total cost of cultivation of from major pulse crops (urd bean, moong bean and gram) was higher in case of gram (₹ 28576.66 ) as compared to urd bean (₹ 23239.66) and moong bean (₹ 21200.66) per hectare. The Variable cost on urd bean, moong bean and gram was ₹ 13288.96 per hectare, ₹ 12367.72 per hectare and ₹ 17348.56 per hectare, respectively.



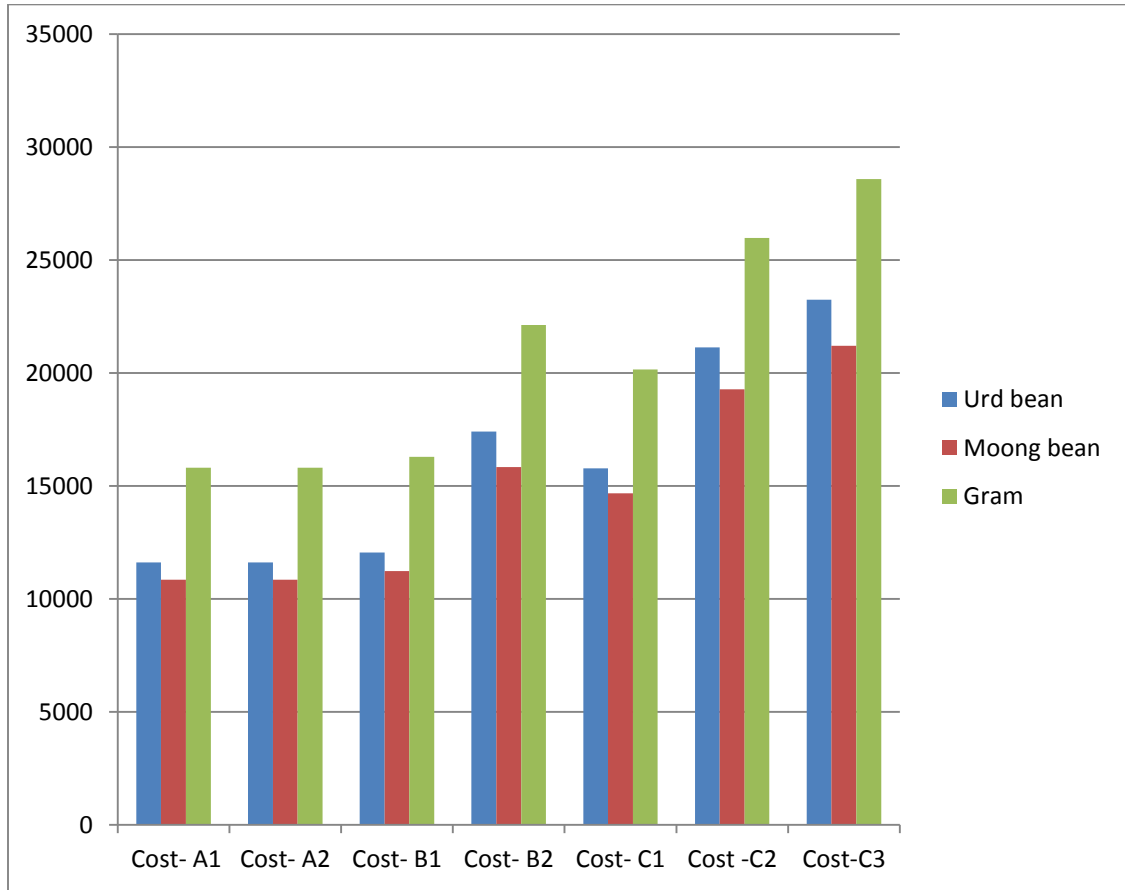
**Fig. 4.1. Cost of cultivation of major pulses of sample farms under study area according to cost structure (per hectare)**

#### 4.1.2 Cost concept-wise analysis of major pulse crops

In order to have the detailed view of the cost of cultivation of major pulse crops (urd bean, moong bean and gram), various cost concepts were worked out on per hectare basis and presented in Table 4.2 which revealed that the per hectare cost-A<sub>1</sub> on urd bean, moong bean and gram was ₹ 11605.73, ₹ 10840.83 and ₹ 15800.91, respectively. Cost-A<sub>2</sub> on urd bean, moong bean and gram was ₹ 11605.73 /ha, ₹ 10840.83/ha and ₹ 15800.91/ha, respectively. However, cost-A<sub>2</sub> was equal to cost-A<sub>1</sub> as there no rent paid on leased in land in all the three major pulse crops. Cost-B<sub>1</sub> on urd bean, moong bean and gram was ₹ 12049.39, ₹ 11231.71 and ₹ 16289.41 and cost-B<sub>2</sub> was ₹ 17399.39 /ha, ₹ 15835.88 /ha and ₹ 22113.41 /ha, respectively. The per hectare cost-C<sub>1</sub> was ₹ 15776.96 on urd bean, ₹ 14669.16 on moong bean and ₹ 20154.78 on gram. The per hectare cost-C<sub>2</sub> was ₹ 21126.96 on urd bean, ₹ 19273.33 on moong bean and ₹ 25978.78 on gram. After working out cost of managerial charges i.e. 10 percent of cost-C<sub>2</sub>, per hectare cost-C<sub>3</sub> was ₹ 23239.66/ha on urd bean, ₹ 21200.66 /ha on moong bean and ₹ 28576.66/ha.

**Table 4.2. Cost of cultivation of major pulses on sample farms under study area according to cost concept (₹/ha.)**

Particulars	Urd bean	Moong bean	Gram
<b>Cost -A<sub>1</sub></b>			
Casual Labour	1407.18	1260.48	1742.24
Farm Machinery	2812.87	2812.87	2812.87
Seed	1284.16	1250.2	4138.2
Fertilizer	1804.86	1460.26	1286.78
Plant protection chemicals	1105.59	1080.74	1914.32
Interest on working capital	728.53	678.12	945.59
Depreciation charges	1894.34	1760.56	2167.72
Land revenue	150	150	150
Miscellaneous expenditure	418.2	387.6	643.19
Total Cost- A <sub>1</sub>	11605.73	10840.83	15800.91
<b>Cost -A<sub>2</sub></b>			
Cost -A <sub>1</sub>	11605.73	10840.83	15800.91
Rent paid for leased-in land	0	0	0
Total Cost- A <sub>2</sub>	11605.73	10840.83	15800.91
<b>Cost -B<sub>1</sub></b>			
Cost -A <sub>1</sub>	11605.73	10840.83	15800.91
Imputed interest on fixed capital (excluding land)	443.66	390.88	488.5
Total Cost- B <sub>1</sub>	12049.39	11231.71	16289.41
<b>Cost -B<sub>2</sub></b>			
Cost -B <sub>1</sub>	12049.39	11231.71	16289.41
Imputed rental value of owned land	5350	4604.17	5824
Rent paid for leased-in land	0	0	0
Total Cost- B <sub>2</sub>	17399.39	15835.88	22113.41
<b>Cost -C<sub>1</sub></b>			
Cost -B <sub>1</sub>	12049.39	11231.71	16289.41
Family labour	3727.57	3437.45	3865.37
Total Cost- C <sub>1</sub>	15776.96	14669.16	20154.78
<b>Cost -C<sub>2</sub></b>			
Cost -B <sub>2</sub>	17399.39	15835.88	22113.41
Family labour	3727.57	3437.45	3865.37
Total Cost -C <sub>2</sub>	21126.96	19273.33	25978.78
<b>Cost -C<sub>3</sub></b>			
Cost -C <sub>2</sub>	21126.96	19273.33	25978.78
Managerial Cost (10 % of Cost-C <sub>2</sub> )	2112.7	1927.33	2597.88
Total Cost-C <sub>3</sub>	23239.66	21200.66	28576.66



**Fig. 4.2. Cost of cultivation of major pulses on sample farms under study area according to cost concept (per hectare)**

### 4.1.3 Yields, Returns and Net returns over various costs

Yields, Returns and net returns over various costs (based on cost concept) are presented in table 4.3. In case of yield of the crop, main product have been taken into consideration. Main product i.e. pulse grain, was 5.35 qtl./ha of urd bean, 4.25 qtl./ha of moong bean and 6.24 qtl./ha of gram. Return over urd bean was, ₹ 32100, Return over moong was, ₹ 27625 and Return over gram was, ₹ 34944 per hectare respectively.

The table 4.13 also displays net returns over different costs based on cost concept. Net return over different costs for urd bean was higher as compare to the moong bean and gram.

Benefit cost ratio was also presented in table 4.13. Benefit cost ratio over different costs for urd bean was higher as compare to the moong bean and gram.

**Table 4.3. Yields, Returns and Net returns over various costs (based on cost concept) in major pluses cultivation of farmers under study area**

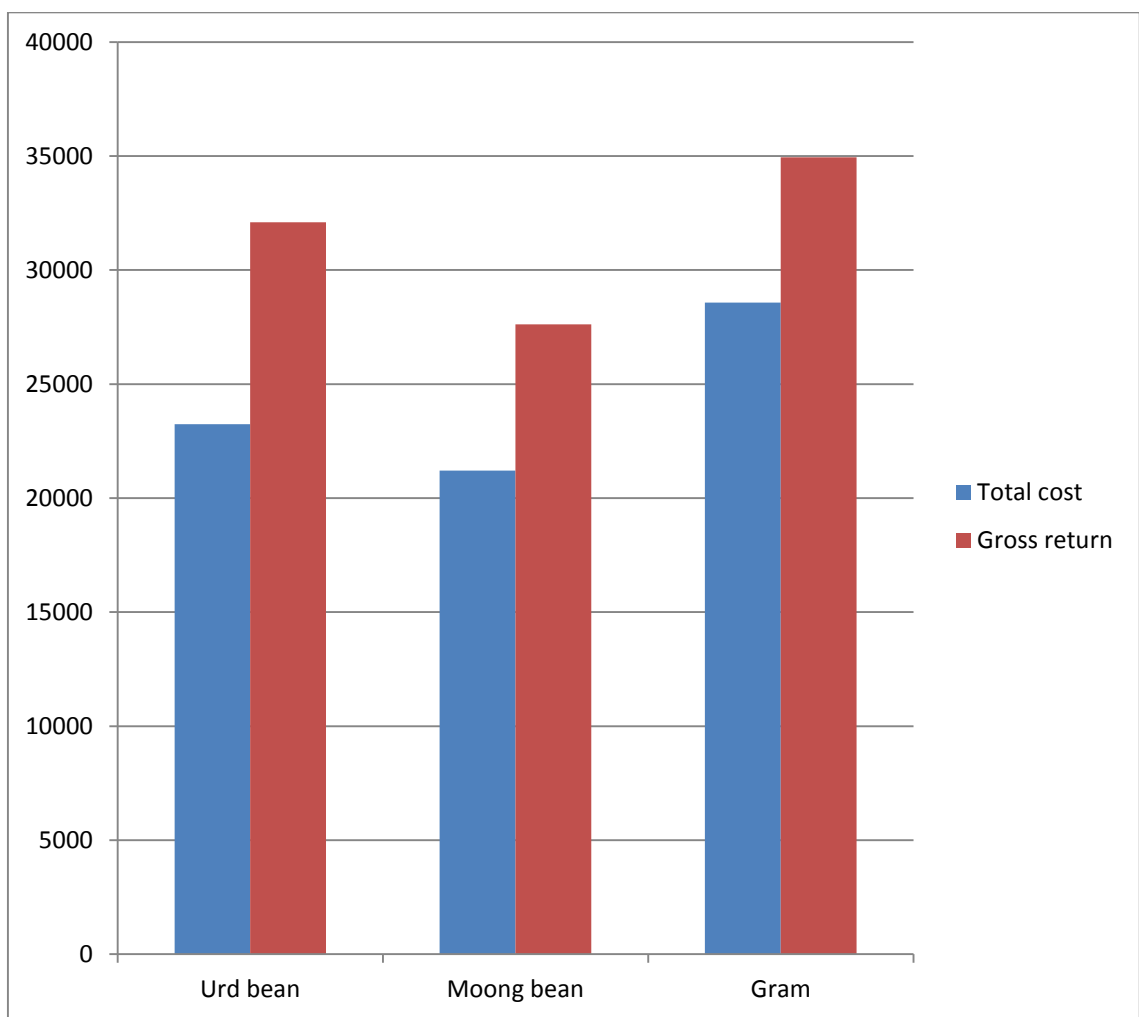
Particulars	Urd bean	Moong bean	Gram
Yield (qtl./ha.)	5.35	4.25	6.24
Return (Rs./ha)	32100.00	27625.00	34944.00
<b>Net return over cost (Rs./ha)</b>			
A <sub>1</sub>	20494.27	16784.17	19143.09
A <sub>2</sub>	20494.27	16784.17	19143.09
B <sub>1</sub>	20050.61	16393.29	18654.59
B <sub>2</sub>	14700.61	11789.12	12830.59
C <sub>1</sub>	16323.04	12955.84	14789.22
C <sub>2</sub>	10973.04	8351.67	8965.22
C <sub>3</sub>	8860.34	6424.34	6367.34
<b>Benefit Cost Ratio</b>			
A <sub>1</sub>	2.77	2.55	2.21
A <sub>2</sub>	2.77	2.55	2.21
B <sub>1</sub>	2.66	2.46	2.15
B <sub>2</sub>	1.84	1.74	1.58
C <sub>1</sub>	2.03	1.88	1.73
C <sub>2</sub>	1.52	1.43	1.35
C <sub>3</sub>	1.38	1.30	1.22

#### 4.1.4 Costs and returns structure of pulse crops (urd bean, moong bean and gram) production

Costs and returns of major pulses (urd bean, moong bean and gram) are displayed in table 4.4. These costs are related to cost structure. These are variable cost, fixed cost and managerial cost. Variable cost was found higher in case of Gram, ₹ 17348.56 as compare to moong bean, ₹ 12367.72 and urd bean ₹ 13288.96 per hectare. Fixed cost was also found to be highest in gram, ₹ 8630.22 as compare to urd bean, ₹ 7838.00 and moong bean, ₹ 6905.61. Percentage shares of variable costs were found to be higher than those of fixed costs in all of the three major Pulses. Managerial cost which depends on both variable and fixed cost was also found to be higher in case of gram. Irrespective of the size categories, this was noted to be ₹ 2525 per hectare. Cost of cultivation of gram was noted to be highest in all of the three major Pulses. These were ₹ 23239.66 per hectare in urd bean, ₹ 21200.66 per hectare in moong bean and ₹ 28576.66 per hectare in gram, respectively. Gross return was noted to be higher in case of gram. Benefit-cost ratio was found to be highest in case of urd bean and lowest in case of gram. Benefit cost ratio was recorded 1.38 in Urd bean, 1.30 in moong bean and 1.22 in gram.

**Table 4.4. Cost and return of major pulses on sample farms under study area (per hectare)**

S.No.	Particulars	Urd bean	Moong bean	Gram
<b>1.</b>	<b>Cost</b>			
	<b>Variable cost</b>	13288.96	12367.72	17348.56
	<b>Fixed cost</b>	7838.00	6905.61	8630.22
	<b>Managerial cost</b>	2112.70	1927.33	2597.88
	<b>Total cost</b>	23239.66	21200.66	28576.66
<b>2.</b>	<b>Return</b>			
	<b>Gross return</b>	32100.00	27625.00	34944.00
	<b>Net return</b>	8860.34	6424.34	6367.34
	<b>B. C. Ratio</b>	1.38	1.30	1.22



**Fig. 4.3. Cost and return of major pluses on sample farms under study area (per hectare)**

## **4.2 Resource use efficiency**

Results of regression analysis and marginal value of product of Costs and returns of major pulses (urd bean, moong bean and gram) production in study area is estimated and presented in Table 4.5, 4.6, 4.7.

### **4.2.1 Regression analysis and resource use efficiency for urd bean**

Yield of urd bean was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The perusal of the data depicted in Table 4.5 reveals that in the analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.88 which is statistically highly significant, meaning that 88 per cent of the total variation is due to above mentioned variables and the Adj-  $R^2$  value was 0.85 which is statistically significant. Table 4.5 further indicates that the regression coefficient of machine labour was found to be significant at 10 per cent level of probability and fertilizer was found to be negatively significant at 10 per cent level of probability and their values were recorded at 0.285 and -0.095, respectively. The regression coefficients of Seed and plant protection chemicals were significant at 5 per cent level of probability. The regression coefficient of human labour was significant at 1 per cent level of probability. From Table 4.15 it is further observed that the resource use efficiency of machine labour, human labor seed and plant protection chemicals were positive with their values at 3.26, 1.17, 8.00 and 7.70 respectively and the resource use efficiency estimated for fertilizer was negative with their values at -0.095, respectively. There is further scope of increasing the productivity and return by using more machine labour, human labour, seeds and plant protection in urd bean.

**Table 4.5: Estimated regression coefficients of various factors, their standard errors and Marginal Value of Product (MVP) for urd bean cultivation on selected farms**

Variables	Regression Coefficients	Standard Error	MVP	VIF
Constant ( $\alpha$ )	1.338	0.266	-	
Human labour ( $X_1$ )	0.184*	0.431	1.17	5.13
Machine labour ( $X_2$ )	0.285***	0.423	3.26	6.49
Seeds ( $X_3$ )	0.315**	0.411	8.00	8.10
Fertilizer ( $X_4$ )	-0.095***	0.518	-1.70	2.37
Plant protection chemicals ( $X_5$ )	0.268**	0.369	7.70	8.90
Coefficient of Determination ( $R^2$ ) = 0.88				
Adj- $R^2$ = 0.85				

\* Significant at 1 % level of significance

\*\* Significant at 5 % level of significance

\*\*\* Significant at 10 % level of significance

#### 4.2.2 Regression analysis and resource use efficiency for moong bean

Yield of moong bean was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The perusal of the data depicted in Table 4.6 reveals that in the analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.95 which was statistically highly significant, meaning that 95 per cent of the total variation was due to above mentioned variables and the Adj-  $R^2$  value was 0.92 which is statistically significant.. Table 4.16 further indicates that the regression coefficient of machine labour, fertilizer and plant protection was found to be non-significant .The regression coefficients of seed was found to be significant at 1 per cent level of probability and human labour was found to be significant at 5 per cent level, with their values at 2.70 and 0.98. There is further scope of increasing the productivity and return by using more human labour , machine labour, seed, fertilizer and plant protection in Moong bean.

**Table 4.6: Estimated regression coefficients of various factors, their standard errors and Marginal Value of Product (MVP) for moong bean cultivation on selected farms**

<b>Variables</b>	<b>Regression Coefficients</b>	<b>Standard Error</b>	<b>MVP</b>	<b>VIF</b>
Constant ( $\alpha$ )	1.176	0.058	-	
Human labour ( $X_1$ )	0.454**	0.040	2.70	3.59
Machine labour ( $X_2$ )	0.099	0.028	0.94	11.64
Seeds ( $X_3$ )	0.043*	0.017	0.98	4.83
Fertilizer ( $X_4$ )	0.201	0.018	4.52	12.90
Plant protection chemicals ( $X_5$ )	0.145	0.018	3.40	10.25
Coefficient of Determination ( $R^2$ ) = 0.95				
Adj- $R^2$ = 0.92				

\* Significant at 1 % level of significance

\*\* Significant at 5 % level of significance

### 4.2.3 Regression analysis and resource use efficiency in Gram

Yield of gram was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The perusal of the data depicted in Table 4.7 reveals that in the analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.97 which was statistically highly significant meaning that 97 per cent of the total variation was due to the above mentioned variables the Adj-  $R^2$  value was 0.94 which is statistically significant. and . Table 4.17 further indicates that the regression coefficient of seed was found to be significant at 1 per cent level of probability, machine labour was found to be significant at 5 per cent level of probability and their values were 0.005 and 0.097, respectively. The regression coefficient of human labour and fertilizer were non-significant. Table 4.17 it is further observed that the resource use efficiency of plant protection chemicals was found to be negatively significant at 10 per cent level of probability with their value at -4.49 There is further scope of increasing the productivity and return by using more human labour, machine labour, and fertilizer in Gram.

**Table 4.7: Estimated regression coefficients of various factors, their standard errors and Marginal Value of Product (MVP) for gram cultivation on selected farms**

Variables	Regression Coefficients	Standard Error	MVP	VIF
Constant ( $\alpha$ )	1.141	0.040	-	
Human labour ( $X_1$ )	0.528	0.059	3.49	13.99
Machine labour ( $X_2$ )	.097**	0.045	1.31	4.65
Seeds ( $X_3$ )	0.005*	0.064	0.04	2.90
Fertilizer ( $X_4$ )	0.080	0.020	2.52	14.55
Plant protection chemicals ( $X_5$ )	-0.258***	0.047	-4.94	3.28
Coefficient of Determination ( $R^2$ ) = 0.97				
Adj- $R^2$ = 0.94				

\* Significant at 1 % level of significance

\*\* Significant at 5 % level of significance

\*\*\* Significant at 10 % level of significance

### 4.3 Marketing structure and efficiency of major pulses (urd bean, moong bean and gram)

An efficient marketing structure minimizes costs and benefits all section of society. Thus, marketing of any product is the ultimate stage of any production system. A marketing system should be such that the produce should reach to consumer in good state without damage with least cost and within a shortest time after harvest. An efficient marketing system is an important mean for raising the income level of the farmers.

The main objectives of an efficient marketing system are: (a) to enable the primary producers to reap the best possible benefits; (b) to make available all products of farm origin to consumers at reasonable price without impairing the quality of the produce; (c) to provide facilities for lifting all produce, the farmers are willing to sell at an incentive price; (d) to reduce the price spread between the primary produce and ultimate consumer. The marketing analysis for major pulses (urd bean, moong bean and gram) in the study area has been presented below.

### 4.3.1 Production, Consumption, Marketable Surplus and Marketed Surplus of major pulses (urd bean, moong bean and gram) in the study area

Per hectare production, consumption, marketable surplus and marketed surplus of major pulses (urd bean, moong bean and gram) was worked out and presented in Table 4.8 which revealed that on an average, marketable surplus of gram (4.60 quintal/ha) was highest followed by urd bean (3.53 quintal/ha) and moong bean (2.68 quintal/ha). The marketed surplus was also highest in case of gram with 4.60 quintal followed by urd bean with 3.53 quintal and moong bean with 2.68 quintal. The average all farms per family marketable and marketed surplus was 2.40 quintal and 2.29 quintal, respectively. Quantity of produce retained for home consumption was 1.52 quintal in case of urd bean followed by moong bean, 1.47 quintal and 1.28 quintal in case of gram, per/ha. Quantity of produce retained for other purposes 0.19 quintal in case of urd bean

**Table 4.8: Production, Consumption, Marketable Surplus and Marketed Surplus of major pluses on sample farms under study** (qty. in qtl./ha.)

Particulars Crops	Production (qtl.)	Home Consumption (qtl.)	Given as wages (qtl.)	Retained for seed (qtl.)	Marketable Surplus (qtl.)	Marketed Surplus (qtl.)
Urd bean	5.35	1.52	0.19	0.11	3.53	3.53
Moong bean	4.25	1.47	-	0.10	2.68	2.68
Gram	6.24	1.28	-	0.36	4.60	4.60

### 4.3.2 Marketing pattern

The main marketing channels identified in the study area which were involved in the marketing of major pulses (urd bean, moong bean and gram) can be summarized as follows:

**Channel-I:** Producer → Village trader → wholesaler → Retailer → Consumer

**Channel-II:** Producer → wholesaler → Retailer → Consumer

**Channel-III:** Producer → Consumer

These three types of marketing channels were worked out in the study area and are presented in Table 4.9, 4.10 and 4.11

### **4.3.3 Marketing cost and marketing margin of urd bean under different marketing channels**

The marketing cost, marketing margin and price spread under different marketing channels of urd bean in the study area was worked out and presented in Table 4.9, which revealed that cost of production for one quintal of urd bean in channel-I was ₹ 6400, marketing cost was ₹ 5 and net marketing margin of producer ₹ 2051.14 per quintal. For village trader, net marketing margin and marketing cost was ₹ 82 per quintal and 168 per quintal, respectively and price received by village trader ₹ 6650 per quintal. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 287 per quintal and price received by wholesaler ₹ 7000 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 406 per quintal and Price paid by consumer in channel-I was ₹ 7500 per quintal. In marketing channel-II, the price received by producer was ₹ 6600 per quintal. The total marketing cost incurred by producer was ₹ 75 per quintal and marketing margin of ₹ 2181.14 per quintal to the producer. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 237 per quintal and price received by wholesaler ₹ 7000 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 406 per quintal and Price paid by consumer in channel-I was ₹ 7500 per quintal

In marketing channel-III, the price received by producer was ₹ 6400 per quintal. The total marketing cost incurred by producer was ₹ 5 per quintal and marketing margin of ₹ 2051.14 per quintal to the producer. Price paid by consumer in marketing channel-III was ₹ 6400 per quintal of produce.

**Table 4.9: Marketing costs and marketing margins of urd bean under different Marketing channels**  
(in ₹/qtl.)

Sr. No.	Particulars	Channels		
		I	II	III
<b>1.</b>	Price received by Producer	6400.00	6600.00	6400.00
	(A) Cost of production	4343.86	4343.86	4343.86
	Marketing cost of Producer			
	i) Transportation cost	-	25.00	
	ii) Packing	-	15.00	
	iii) Loading/unloading	-	10.00	
	iv) Helping hand	-	5.00	
	v) Others (Miscellaneous)	5.00	20.00	
	Total marketing cost	5.00	75.00	5.00
	Marketing margin	2051.14	2181.14	2051.14
<b>2.</b>	Price paid by village trader	6400.00	-	-
	Marketing cost of village trader			
	i) Transportation cost	25.00	-	-
	ii) Packing	15.00	-	-
	iii) Loading/unloading	10.00	-	-
	iv) Helping hand	5.00	-	-
	v) Spoilage	12.00	-	-
	vi) Others (Miscellaneous)	15.00		
	Total marketing cost	82.00	-	-
	Marketing margin	168.00	-	-
<b>3.</b>	Price paid by wholesaler	6650.00	6600.00	-
	Marketing cost of wholesaler			
	i) Loading/unloading	10.00	10.00	-
	ii) Helping hand	5.00	5.00	-
	iii) Storage	18.00	18.00	-
	iv) Spoilage	15.00	15.00	-
	v) Tax	5.00	5.00	
	vi) Others (Miscellaneous)	10.00	10.00	-
	Total marketing cost	63.00	63.00	-
	Marketing margin	287.00	237.00	-
<b>4.</b>	Price paid by retailer	7000.00	7000.00	-
	Marketing cost of retailer			
	i) Transportation cost	15.00	15.00	-
	ii) Loading/unloading	10.00	10.00	-
	iii) Helping hand	7.00	7.00	-
	iv) Storage	25.00	25.00	-
	v) Spoilage	20.00	20.00	-
	vi) Tax	5.00	5.00	
	vii) Others (Miscellaneous)	12.00	12.00	-
	Total marketing cost	94.00	94.00	-
	Marketing margin	406.00	406.00	-
<b>5.</b>	Price paid by consumer	7500.00	7500.00	6400.00

#### 4.3.4 Marketing cost and marketing margin of Moong bean under different marketing channels

The marketing cost, marketing margin and price spread under different marketing channels of urd bean in the study area was worked out and presented in Table 4.10, which revealed that cost of production for one quintal of moong bean in channel-I was ₹ 5900, marketing cost was ₹ 5 and net marketing margin of producer ₹ 906.60 per quintal. For village trader, net marketing margin and marketing cost was ₹ 82 per quintal and 118 per quintal, respectively and price received by village trader ₹ 6100 per quintal. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 187 per quintal and price received by wholesaler ₹ 6350 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 256 per quintal and Price paid by consumer in channel-I was ₹ 6700 per quintal

In marketing channel-II, the price received by producer was ₹ per quintal. The total marketing cost incurred by producer was ₹ 75 per quintal and marketing margin of ₹ 1036.6 per quintal to the producer. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 187 per quintal and price received by wholesaler ₹ 6350 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 256 per quintal and Price paid by consumer in channel-I was ₹ 6700 per quintal

In marketing channel-III, the price received by producer was ₹ 5900 per quintal. The total marketing cost incurred by producer was ₹ 5 per quintal and marketing margin of ₹ 906 per quintal to the producer. Price paid by consumer in marketing channel-III was ₹ 5900 per quintal of produce.

**Table 4.10: Marketing costs and marketing margins of moong bean under different Marketing channels** (in ₹/qtl.)

Sr. No.	Particulars	Channels		
		I	II	III
<b>1.</b>	Price received by Producer	5900.00	6100.00	5900.00
	(A) Cost of production	4988.40	4988.40	4988.40
	Marketing cost of Producer			
	i) Transportation cost	-	25.00	
	ii) Packing	-	15.00	
	iii) Loading/unloading	-	10.00	
	iv) Helping hand	-	5.00	
	v) Others (Miscellaneous)	5.00	20.00	
	Total marketing cost	5.00	75.00	5.00
	Marketing margin	906.60	1036.6	906.60
<b>2.</b>	Price paid by village trader	5900.00	-	-
	Marketing cost of village trader			
	i) Transportation cost	25.00	-	-
	ii) Packing	15.00	-	-
	iii) Loading/unloading	10.00	-	-
	iv) Helping hand	5.00	-	-
	v) Spoilage	12.00	-	-
	vi) Others (Miscellaneous)	15.00	-	-
	Total marketing cost	82.00	-	-
	Marketing margin	118.00	-	-
<b>3.</b>	Price paid by wholesaler	6100.00	6100.00	-
	Marketing cost of wholesaler			
	i) Loading/unloading	10.00	10.00	-
	ii) Helping hand	5.00	5.00	-
	iii) Storage	18.00	18.00	-
	iv) Spoilage	15.00	15.00	-
	v) Tax	5.00	5.00	-
	vi) Others (Miscellaneous)	10.00	10.00	-
	Total marketing cost	63.00	63.00	-
	Marketing margin	187.00	187.00	-
<b>4.</b>	Price paid by retailer	6350.00	6350.00	-
	Marketing cost of retailer			
	i) Transportation cost	15.00	15.00	-
	ii) Loading/unloading	10.00	10.00	-
	iii) Helping hand	7.00	7.00	-
	iv) Storage	25.00	25.00	-
	v) Spoilage	20.00	20.00	-
	vi) Tax	5.00	5.00	-
	vii) Others (Miscellaneous)	12.00	12.00	-
	Total marketing cost	94.00	94.00	-
	Marketing margin	256.00	256.00	-
<b>5.</b>	Price paid by consumer	6700.00	6700.00	5900.00

#### 4.3.5 Marketing cost and marketing margin of Gram under different marketing channels

The marketing cost, marketing margin and price spread under different marketing channels of gram in the study area was worked out and presented in Table 4.11, which revealed that cost of production for one quintal of gram in channel-I was ₹ 5500, marketing cost was ₹ 5 and net marketing margin of producer ₹ 915 per quintal. For village trader, net marketing margin and marketing cost was ₹ 82 per quintal and 118 per quintal, respectively and price received by village trader ₹ 5700 per quintal. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 237 per quintal and price received by wholesaler ₹ 6000 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 306 per quintal and Price paid by consumer in channel-I was ₹ 6400 per quintal

In marketing channel-II, the price received by producer was ₹ 5700 per quintal. The total marketing cost incurred by producer was ₹ 75 per quintal and marketing margin of ₹1045.6 per quintal to the producer. For wholesaler marketing cost of ₹ 63 per quintal and marketing margin of ₹ 237 per quintal and price received by wholesaler ₹ 6000 per quintal. For retailer marketing cost of ₹ 94 per quintal and marketing margin of ₹ 306 per quintal and Price paid by consumer in channel- II was ₹ 6400 per quintal

In marketing channel-III, the price received by producer was ₹ 5500 per quintal. The total marketing cost incurred by producer was ₹ 5 per quintal and marketing margin of ₹ 915 per quintal to the producer. Price paid by consumer in marketing channel-III was ₹ 5500 per quintal of produce.

**Table 4.11: Marketing costs and marketing margins of gram under different Marketing channels**  
(in ₹/qtl.)

Sr. No.	Particulars	Channels		
		I	II	III
1.	Price received by Producer	5500.00	5700.00	5500.00
	(A) Cost of production	4580.00	4580.00	4580.00
	Marketing cost of Producer			
	i) Transportation cost	-	25.00	
	ii) Packing	-	15.00	
	iii) Loading/unloading	-	10.00	
	iv) Helping hand	-	5.00	
	v) Others (Miscellaneous)	5.00	20.00	
	Total marketing cost	5.00	75.00	5.00
	Marketing margin	915.00	1045.6	915.00
2.	Price paid by village trader	5500.00	-	-
	Marketing cost of village trader			
	i) Transportation cost	25.00	-	-
	ii) Packing	15.00	-	-
	iii) Loading/unloading	10.00	-	-
	iv) Helping hand	5.00	-	-
	v) Spoilage	12.00	-	-
	vi) Others (Miscellaneous)	15.00		
	Total marketing cost	82.00	-	-
	Marketing margin	118.00	-	-
3.	Price paid by wholesaler	5700.00	5700.00	-
	Marketing cost of wholesaler			
	i) Loading/unloading	10.00	10.00	-
	ii) Helping hand	5.00	5.00	-
	iii) Storage	18.00	18.00	-
	iv) Spoilage	15.00	15.00	-
	v) Tax	5.00	5.00	
	vi) Others (Miscellaneous)	10.00	10.00	-
	Total marketing cost	63.00	63.00	-
	Marketing margin	237.00	237.00	-
4.	Price paid by retailer	6000.00	6000.00	-
	Marketing cost of retailer			
	i) Transportation cost	15.00	15.00	-
	ii) Loading/unloading	10.00	10.00	-
	iii) Helping hand	7.00	7.00	-
	iv) Storage	25.00	25.00	-
	v) Spoilage	20.00	20.00	-
	vi) Tax	5.00	5.00	
	vii) Others (Miscellaneous)	12.00	12.00	-
	Total marketing cost	94.00	94.00	-
	Marketing margin	306.00	306.00	-
5.	Price paid by consumer	6400.00	6400.00	5500.00

#### 4.3.6 Marketing efficiency of different marketing channels for urd bean

Table 4.12 indicated the marketing efficiency and price spread of urd bean in different channels under study. It was found that price received by the producer was ₹ 6400, ₹ 6600 and ₹ 6400 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 2912.14, ₹ 2924.14 and ₹ 2051.14, respectively. The marketing efficiency was found maximum in channel-III (3.11), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 2.09 in channel-II and 2.03 in channel-I.

**Table 4.12: Marketing efficiency and price spread in marketing of urd bean through different channels (₹/qtl.)**

Sr. No.	Particulars	Marketing channels		
		I	II	III
1.	Price received by producer	6400.00	6600.00	6400.00
2.	Marketing Cost (MC)	244.00	232.00	5.00
3.	Marketing Margin (MM)	2912.14	2924.14	2051.14
4.	Marketing Efficiency (ME)	2.03	2.09	3.11

**Channel-I:** “Producer – Village trader – Wholesaler –Retailer - Consumer”

**Channel-II:** “Producer – Wholesaler – Retailer- Consumer”

**Channel-III:** “Producer – Consumer”

#### 4.3.7 Marketing efficiency of different marketing channels for moong bean

Table 4.13 indicated the marketing efficiency and price spread of moong bean in different channels under study. It was found that price received by the producer was ₹ 5900, ₹ 6100 and ₹ 5900 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 1467.60, ₹ 1479.60 and ₹ 906.60, respectively. The marketing efficiency was found maximum in channel-III (6.47), when the produce was sold directly to consumer. When

the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.56 in channel-II and 3.45 in channel-I.

**Table 4.13: Marketing efficiency and price spread in marketing of moong bean through different channel (₹/qtl.)**

Sr. No.	Particulars	Marketing channels		
		I	II	III
1.	Price received by producer	5900.00	6100.00	5900.00
2.	Marketing Cost (MC)	244.00	232.00	5.00
3.	Marketing Margin (MM)	1467.60	1479.60	906.60
4.	Marketing Efficiency (ME)	3.45	3.56	6.47

**Channel-I:** “Producer – Village trader – Wholesaler –Retailer - Consumer”

**Channel-II:** “Producer – Wholesaler – Retailer- Consumer”

**Channel-III:** “Producer – Consumer”

#### 4.3.8 Marketing efficiency of different marketing channels for gram

Table 4.14 indicated the marketing efficiency and price spread of gram in different channels under study. It was found that price received by the producer was ₹ 5500, ₹ 5700 and ₹ 5500 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 1576, ₹ 1588.60 and ₹ 915, respectively. The marketing efficiency was found maximum in channel-III (5.98), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.13 in channel-II and 3.02 in channel-I.

**Table 4.14: Marketing efficiency and price spread in marketing of gram through different channels (₹/qtl.)**

Sr. No.	Particulars	Marketing channels		
		I	II	III
1.	Price received by producer	5500.00	5700.00	5500.00
2.	Marketing Cost (MC)	244.00	232.00	5.00
3.	Marketing Margin (MM)	1576.00	1588.60	915.00
4.	Marketing Efficiency (ME)	3.02	3.13	5.98

**Channel-I:** “Producer – Village trader – Wholesaler –Retailer - Consumer”

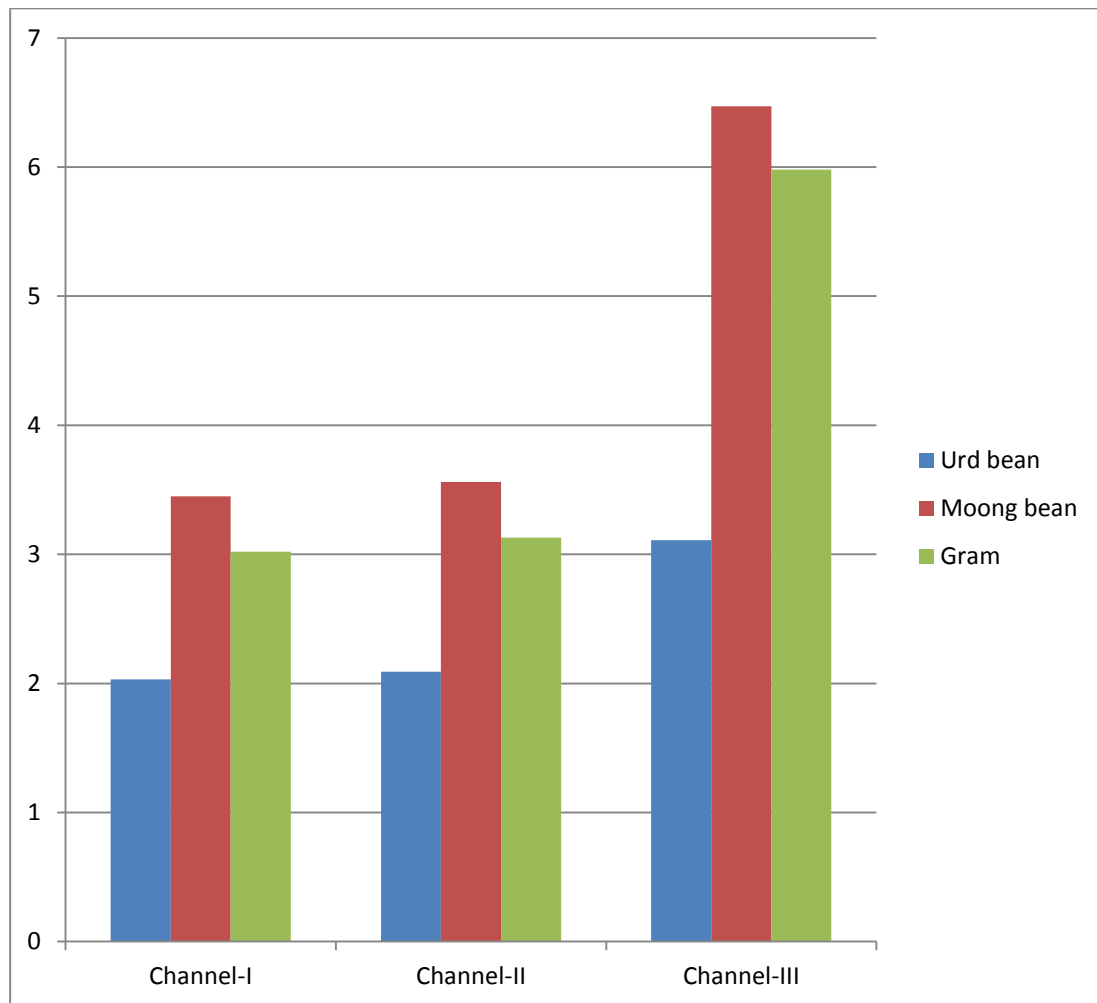
**Channel-II:** “Producer – Wholesaler – Retailer- Consumer”

**Channel-III:** “Producer – Consumer”

#### 4.4 Major constraints

##### 4.4.1 Production constraints faced by major pulse crops producer’s in the study area

The various individual aspect wise constraints were worked out in the study area. These constraints were High labour cost, Unavailability of labour during peak period, involvement of uneducated members in farming, Lack of latest technical knowledge, Lack of finance and credit facilities, Occurrence of diseases & Insect-pest and High cost of pesticides and insecticide, lack of good quality seed and Uncertain rainfall pattern. Table 4.15 revealed the various constraints as perceived by the farmers.



**Fig. 4.4. Marketing efficiency of major pluses through different channels**

**Table 4.15: Constraints faced by the pluses growers in its cultivation**

S.No.	Constraints	Number of farmers (N)		
		Urdbean (N=120)	Moongbean (N=120)	Gram (N=120)
<b>A.</b>	<b>Production Problems</b>			
1.	High labour cost	110 (91.67)	100 (83.33)	115 (95.83)
2.	Unavailability of labour during peak period	87 (72.50)	90 (75.00)	85 (70.83)
3.	involvement of uneducated members in farming	65 (54.17)	70 (58.33)	64 (53.33)
4.	Lack of latest technical knowledge	45 (37.50)	50 (41.67)	44 (36.67)
5.	Lack of finance and credit facilities	40 (33.33)	35 (29.17)	22 (18.33)
6.	Occurrence of diseases and insect-pest	36 (30.00)	30 (25.00)	50 (41.67)
7.	High cost of pesticides and insecticide	32 (26.67)	25 (20.83)	25 (20.83)
8.	Lack of good quality seed	30 (25.00)	26 (21.67)	20 (16.67)
9.	Uncertain rainfall pattern	28 (23.33)	25 (20.83)	25 (20.83)

Figures in parentheses are the percentages of the total number of farmers.

#### **4.4.1 Marketing constraints faced by major pulse crops producer's in the study area**

Regarding marketing constraints it was observed that Lack of remunerative price for the produce was the main constraint and was ranked I by the respondents. Unorganized market, High cost of transportation and Lack of market information were ranked II, III and IV respectively. Table 4.16 revealed the various constraints as perceived by the farmers.

**Table 4.16: Constraints faced by the pluses growers in marketing**

S.No.	Constraints	Number of farmers (N)		
		Urdbean (N=120)	Moongbean (N=120)	Gram (N=120)
<b>A.</b>	<b>Marketing Problems</b>			
<b>1.</b>	Lack of remunerative price for the produce	100 (83.33)	112 (93.33)	115 (95.83)
<b>2.</b>	Un-organized market	80 (66.67)	85 (70.83)	82 (68.33)
<b>3.</b>	High cost of transportation	75 (62.50)	68 (56.67)	74 (61.67)
<b>4.</b>	Lack of market information	45 (37.50)	50 (41.67)	48 (40.00)

Figures in parentheses are the percentages of the total number of farmers.

# DISCUSSION

## CHAPTER 5

### DISCUSSION

The results obtained during the present investigation entitled, “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state” in preceding chapters has been discussed under the following heads:

- 5.1 Costs and returns
- 5.2 Resource use efficiency
- 5.3 Marketing structure and efficiency
- 5.4 Major constraints

#### **5.1 Costs and returns**

The analysis of per hectare cost structure of major pulse crops (urd bean, moong bean and gram) cultivation in Table 4.1 revealed that total cost of cultivation was higher on gram (₹ 28576.66/ha) followed by urd bean (₹ 23239.66/ha) and marginal farms (₹ 21200.66/ha). The operational cost on gram (₹ 17348.56/ha), urd bean (₹ 13288.96/ha) and moong bean (₹ 12367.72/ha) and constituted 60.7 percent, 57.18 percent and 58.33 percent of the total cost on gram, urd bean and medium farms, respectively. Total human labour (hired and family), the major operational cost component, worked out to be ₹ 5607.61 per hectare on gram, ₹ 5134.75 per hectare on urd bean and ₹ 4697.93 on moong bean which was 32.32, 38.63 and 37.98 percent of operational cost and 19.62, 22.09, and 22.15 percent of the total cost. In case of fixed cost, the expenditure on rental value of owned land was major cost component, worked out to be ₹ 5824/ha on gram ₹ 5350/ha on urd bean and ₹ 4604.17/ha on moong bean. Which was 67.48, 68.28 and 66.67 percent of total fixed cost and 20.38, 23.2 and 21.71 percent of total cost on gram, urd bean and moong bean. These findings are supported by Hedge *et al.*, (2013) and Divya, 2014.

The cost concepts of major pulse crops (urd bean, moong bean and gram) cultivation (Table 4.2) indicated that the costs of cultivation is higher in case of gram followed by urd bean and moong bean. Out of the seven cost concept used, cost-C<sub>3</sub> was

highest in all three major pulse crops worked out to be ₹ 28576.66/h on gram, ₹ 23239.66 on urd bean and ₹ 21200.66 on moong bean per hectare followed by cost-C<sub>2</sub>, ₹ 25978.78/ha on gram, ₹ 21126.96/ha on urd bean and ₹ 19273.33/ha on moong bean, cost-B<sub>2</sub> ₹ 22113.41/ha on gram, ₹ 17399.39/ha on urd bean and ₹ 15835.88/ha on moong bean, cost-B<sub>1</sub>, ₹ 16289.41/ha on gram, ₹ 12049.39/ha on urd bean and ₹ 11231.71/ha on moong bean, cost-A<sub>2</sub>, ₹ 15800.91/ha on gram, ₹ 11605.73 /ha on urd bean and ₹ 10840.83/ha on moong bean, cost-A<sub>1</sub> ₹ 15800.91 on gram, ₹ 11605.73 on urd bean and ₹ 10840.83 on moong bean per hectare, respectively. Cost-A<sub>2</sub> was equal to cost-A<sub>1</sub> as there was no rent paid on leased in land in all the three major pulse crops. These findings are in close conformity with Hatai *et al.* 2011 and Sharma *et al.* 2012.

Results related to yields, returns and net returns over various costs (based on cost concept) are presented in table 4.3. In case of yield of the crop, main product has been taken into consideration. Main product i.e. pulse grain, was 5.35 qtl./ha of urd bean, 4.25 qtl./ha of moong bean and 6.24 qtl./ha of gram. Return over urd bean was, ₹ 32100, Return over moong was, ₹ 27625 and Return over gram was, ₹ 34944 per hectare respectively. The table 4.3 also displays net returns over different costs based on cost concept. Net return over different costs for urd bean was higher as compare to the moong bean and gram. Cost-A<sub>1</sub> was ₹ 20494.27 on urd beans, ₹ 16784.17 on moong bean and ₹ 19143.09 on grams. Cost-A<sub>2</sub> was ₹ 20494.27 on urd beans, ₹ 16784.17 on moong bean and ₹ 19143.09 on grams. Cost-B<sub>1</sub> was ₹ 20050.61 on urd beans, ₹ 16393.29 on moong bean and ₹ 18654.59 on grams. Cost-B<sub>2</sub> was ₹ 14700.61 on urd beans, ₹ 11789.12 on moong bean and ₹ 12830.59 on grams. Cost-C<sub>1</sub> was ₹ 16323.04 on urd beans, ₹ 12955.84 on moong bean and ₹ 14789.22 on grams. Cost-C<sub>2</sub> was ₹ 10973.04 on urd beans, ₹ 8351.67 on moong bean and ₹ 8965.22 on grams. Cost-C<sub>3</sub> was ₹ 8860.34 on urd beans, ₹ 6424.34 on moong bean and ₹ 6367.34 on grams.

Benefit cost ratio over different costs was also presented in table 4.3. Benefit cost ratio over different costs for urd bean was higher as compare to the moong bean and gram. Benefit cost ratio on cost-A<sub>1</sub> was 2.77 for urd bean, 2.77 for moong bean and 2.21 for gram, on cost-A<sub>2</sub>, 2.77 for urd bean, 2.77 for moong bean and 2.21 for gram, on cost-B<sub>1</sub>, 2.66 for urd bean, 2.46 for moong bean and 2.15 for gram, on cost-B<sub>2</sub>, 1.84 for urd bean,

1.74 for moong bean and 1.58 for gram, on cost-C<sub>1</sub>, 2.03 for urd bean, 1.88 for moong bean and 1.73 for gram, on cost-C<sub>2</sub>, 1.52 for urd bean, 1.43 for moong bean and 1.35 for gram, on cost-C<sub>3</sub>, 1.3866 for urd bean, 1.30 for moong bean and 1.22 for gram. These findings are supported by Sharma *et al.* 2012.

The cost and return structure of major pulse crops (urd bean, moong bean and gram) cultivation (Table 4.4) indicated the total variable cost for urd bean, moong bean and gram worked out to be ₹ 13288.96, ₹ 12367.72 and ₹ 17348.56 per hectare, which were 57.18 per cent, 58.33 per cent and 60.70 per cent of the total cost of cultivation and total fixed cost worked out to be ₹ 7838.00, ₹ 6905.61 and ₹ 8630.22, which were 33.72 per cent, 32.57 percent and 30.20 per cent of the total cost of cultivation, respectively. The gross returns on major pulse crops (urd bean, moong bean and gram) were ₹ 32100.00, ₹ 27625.00 and ₹ 34944.00 and net return were ₹ 8860.34, ₹ 6424.34 and ₹ 6367.34 with benefit cost ratio of 1.38, 1.30 and 1.22. Although, the benefit cost ratio was higher on urd bean (1.38) as compared to moong bean (1.30) and gram (1.22). As benefit cost ratio of urd bean was much more than all major pulse crops, which suggest that urd bean cultivation is economically very much profitable in the study area. These findings are in close conformity with those of Hatai *et al.* 2011 and Sharma *et al.* 2012.

## 5.2 Resource use efficiency

### Urd bean

It is evident from the table 4.5 that the yield of urd bean which was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. The data further depicted that in the analysis of crop production function, coefficient of determination ( $R^2$ ) value came out to be 0.88 which is statistically highly significant, meaning that 88 per cent of the total variation is due to above mentioned variables and the Adj-  $R^2$  value was 0.85 which is statistically significant. Table 4.5 further indicates that the regression coefficient of machine labour was found to be significant at 10 per cent level of probability and fertilizer was found to be negatively significant at 10 per cent level of probability and their values were recorded at 0.285 and -0.095, respectively. The regression coefficients of seed and plant protection

chemicals were significant at 5 per cent level of probability. The regression coefficient of human labour was significant at 1 per cent level of probability. From Table 4.5 it is further observed that the resource use efficiency of machine labour, human labor seed and plant protection chemicals were positively related with their values at 3.26, 1.17, 8.00 and 7.70 respectively and the resource use efficiency estimated for fertilizer was negative with their values at -0.095, respectively. These findings are supported by Sharma *et al.* 2012 and Pawar *et al.*, (2014)

### **Moong bean**

Table 4.6 depicted the regressed analysis of moong bean which was estimated on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The data represented the analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.95 which was statistically highly significant, meaning that 95 per cent of the total variation was due to above mentioned variables and the Adj-  $R^2$  value was 0.92 which is statistically significant. Table 4.16 further indicates that the regression coefficient of machine labour, fertilizer and plant protection was found to be non-significant. The regression coefficients of seed was found to be significant at 1 per cent level of probability and human labour was found to be significant at 5 per cent level, with their values at 2.70 and 0.98. There is further scope of increasing the productivity and return by using more human labour, machine labour, seed, fertilizer and plant protection in Moong bean. These findings are supported by Sharma *et al.* 2012 and Pawar *et al.*, (2014)

### **Gram**

The table 4.7 revealed various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals on the basis of which the yield of gram was regressed. The scrutiny of the data depicted in Table 4.7 revealed that in the analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.97 which was statistically highly significant. The coefficient of determination indicated that 97 per cent of the total variation was due to the independent variables and the Adj-  $R^2$

value was 0.94 which is statistically significant. Table 4.17 further indicates that the regression coefficient of seed was found to be significant at 1 per cent level of probability, machine labour was found to be significant at 5 per cent level of probability and their values were 0.005 and 0.097, respectively. The regression coefficient of human labour and fertilizer were non-significant. Table 4.17 it is further observed that the resource use efficiency of plant protection chemicals was found to be negatively significant at 10 per cent level of probability with their value at -4.49. The scope of the study can be maximized by increasing the productivity and return by using more human labour, machine labour, and fertilizer in Gram. These findings are supported by Sharma *et al.* 2012 and Pawar *et al.*, (2014)

### **5.3 Marketing structure and efficiency of major pulses (urd bean, moong bean and gram)**

The results (Table 4.8) related to per hectare Production, Consumption, marketable surplus and marketed surplus of major pulse crops in the study area revealed that marketable as well as marketed surplus of moong bean was higher as compared to urd bean and gram. The average per marketed surplus for urd bean, moong bean and gram was 3.53 quintals, 2.68 quintals, 4.60 quintals, respectively. The marketing of produce of all the three major pulse crops (urd bean, moong bean and gram) involved only one intermediary in the study area and that was village trader. Three channels were identified in the marketing of all the three major pulse crops (urd bean, moong bean and gram) in the study area viz. channel-I (Producer - Village Trader – wholesaler – Retailer – Consumer), channel-II (Producer – wholesaler – Retailer – Consumer) and channel-III (Producer – Consumer). These results are in line with the study of Singh *et al.*, (2012) and Parshuramkar *et al.*, (2014)

#### **Urd bean**

The results related to marketing cost and marketing margin of urd bean under different marketing channels (Table 4.9) indicated that for per hectare of urd bean producer received maximum net price in channel-II (₹ 6600) followed by channel-III and channel-I (₹ 6400). Net margin of producer was also highest in channel-II (₹ 2181.14)

followed by channel-II and channel-I (₹ 2051.14). The net margin of village trader, wholesaler and retailer in channel-I was ₹ 168/qttl, ₹ 287/qttl and ₹ 406/qttl. When producer directly sold the produce to wholesaler net margin of wholesaler and retailer was ₹ 237/qttl and ₹ 406/qttl. It was also found that when there was no intermediary in between producer and wholesaler (channel-II), producer gained because the net price received by producer was highest as compare to the price paid by the intermediary. These findings are in close conformity with Singh *et al.* (2010) and Srivastava *et al.* (2010)

The marketing efficiency and price spread of urd bean in different channels under study (Table 4.12) indicated that price received by the producer was ₹ 6400, ₹ 6600 and ₹ 6400 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 2912.14, ₹ 2924.14 and ₹ 2051.14, respectively. The marketing efficiency was found maximum in channel-III (3.11), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 2.09 in channel-II and 2.03 in channel-I. These results are in conformity with those of, Chand *et al.*, (2010) and Bhat *et al.* 2011

### **Moong bean**

The results related to marketing cost and marketing margin of moong bean under different marketing channels (Table 4.10) indicated that for per hectare of urd bean producer received maximum net price in channel-II (₹ 6100) followed by channel-II and channel-I (₹ 5900). Net margin of producer was also highest in channel-II (₹ 1036.6) followed by channel-II and channel-I (₹ 906.60). The net margin of village trader, wholesaler and retailer in channel-I was ₹ 118/qttl, ₹ 187/qttl and ₹ 256/qttl. When producer directly sold the produce to wholesaler net margin of wholesaler and retailer was ₹ 187/qttl and ₹ 256/qttl. It was also found that when there was no intermediary in between producer and wholesaler (channel-II), producer gained because the net price received by producer was highest as compare to the price paid by the intermediary. These findings are in close conformity with Singh *et al.* (2010) and Srivastava *et al.* (2010)

The marketing efficiency and price spread of moong bean in different channels under study (Table 4.13) indicated that price received by the producer was ₹ 5900, ₹ 6100 and ₹ 5900 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 1467.60, ₹ 1479.60 and ₹ 906.60, respectively. The marketing efficiency was found maximum in channel-III (6.47), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.56 in channel-II and 3.45 in channel-I. These findings are in close conformity with Chand *et al.*, (2010) and Bhat *et al.* 2011

### **Gram**

The results related to marketing cost and marketing margin of gram under different marketing channels (Table 4.12) indicated that for per hectare of urd bean producer received maximum net price in channel-II (₹ 5700) followed by channel-II and channel-I (₹ 5500). Net margin of producer was also highest in channel-II (₹ 1045.6) followed by channel-II and channel-I (₹ 915.00). The net margin of village trader, wholesaler and retailer in channel-I was ₹ 118/qtl, ₹ 237/qtl and ₹ 306/qtl. When producer directly sold the produce to wholesaler net margin of wholesaler and retailer was ₹ 237/qtl and ₹ 306/qtl. It was also found that when there was no intermediary in between producer and wholesaler (channel-II), producer gained because the net price received by producer was highest as compare to the price paid by the intermediary. These findings are in close conformity with Singh *et al.* (2010) and Srivastava *et al.* (2010)

The marketing efficiency and price spread of gram in different channels under study (Table 4.14) indicated that price received by the producer was ₹ 5500, ₹ 5700 and ₹ 5500 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 1576, ₹ 1588.60 and ₹ 915, respectively. The marketing efficiency was found maximum in channel-III (5.98), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 3.13 in channel-II and 3.02 in channel-I. These findings are in close conformity with, Chand *et al.*, (2010) and Bhat *et al.* 2011

This supports our hypothesis that marketing of all the three major pulse crops (urd bean, moong bean and gram) is being done efficiently. Hence, the hypothesis stands accepted.

#### **5.4 Major constraints faced by major pulse crops (urd bean, moong bean and gram) producers in its production and marketing**

The various constraints were worked out in the study area and these constraints were production constraints. viz. High labour cost, Unavailability of labour during peak period, involvement of uneducated members in farming, Lack of latest technical knowledge, Lack of finance and credit facilities, Occurrence of diseases & Insect-pest and High cost of pesticides and insecticide, Lack of good quality seed and Uncertain rainfall pattern) and marketing constraints, viz. Lack of remunerative price for the produce, Un-organized market, High cost of transportation and Lack of market information. Based on the results, it can be inferred that in general, the major production and marketing constraints faced by the farmers were High labour cost, Unavailability of labour during peak period, involvement of uneducated members in farming, Lack of latest technical knowledge, Lack of finance and credit facilities, Lack of remunerative price for the produce and Un-organized market.

The results on major production constraints faced by major pulse crops (urd bean, moong bean and gram) producer (Table 4.16) revealed that high labour cost was major constraint in production with MPS 91.67 in urd bean, 83.33 in moong bean and 95.83 in gram, 81 and 78, respectively, unavailability of labour during peak period (MPS 72.50, 75.00, 70.83 in urd bean, moong bean and gram), involvement of uneducated members in farming (MPS 54.17, 58.33, 53.33 in urd bean, moong bean and gram), Lack of latest technical knowledge (MPS 37.50, 41.67, 36.67 in urd bean, moong bean and gram), Lack of finance and credit facilities (MPS 33.33, 29.17, 18.33 in urd bean, moong bean and gram), Occurrence of diseases & Insect-pest (MPS 30.00, 25.00, 41.67 in urd bean, moong bean and gram), High cost of pesticides and insecticide (MPS 26.67, 20.83, 20.83 in urd bean, moong bean and gram), Lack of good quality seed (MPS 25.00, 21.67, 16.67 in urd bean, moong bean and gram), and Uncertain rainfall pattern (MPS 23.33, 20.83, 20.83 in urd bean, moong bean and gram), respectively. In marketing, major constraint

lack Lack of remunerative price for the produce of regulated markets, Un-organized market, High cost of transportation and Lack of market information were major constraints with (MPS 83.33, 93.33, 95.83 in urd bean, moong bean and gram), (MPS 66.67, 70.83, 68.33 in urd bean, moong bean and gram), (MPS 62.50, 56.67, 61.67 in urd bean, moong bean and gram), (MPS 37.50, 41.67, 40.00 in urd bean, moong bean and gram), respectively. These findings are in conformity with those of Kumar *et al.* 2010. and Pathak *et al.* (2016)

# SUMMARY AND CONCLUSIONS

## CHAPTER 6

### SUMMARY AND CONCLUSION

An investigation entitled “Economic Analysis of Production & Marketing of Major Pulse Crops in *Kandi* Belt of Jammu Division of J&K state” was conducted in the Jammu division of J & K state during the year 2017-18. Two blocks were selected from Samba district and from each block five villages were selected randomly. From each block 60 farms were selected randomly to constitute the total sample size of 120 farms. Primary data on costs and returns and production efficiency were collected by interviewing the farmers personally with the help of structured and pretested schedule. Collection of information regarding marketing of pulses was done by visiting growers, village traders as well as middlemen who were involved in marketing of major pulses.

The data collected were subjected to analysis for examine the objective of the investigation viz. cost and returns, production efficiency, marketing efficiency and constraints in production and marketing. Cobb-Douglas production function was used to study the relationship between output and various inputs. The marketing aspect viz. per quintal marketing cost, structures and marketing margin of major pulses worked out. An attempt was also made to study the problems that were faced by the pulses growers in production and marketing in the sample area. The salient findings of the present investigation have been briefly summarized in this chapter.

#### 6.1 Costs and returns

The cost of cultivation of major pulse crops (urd bean, moong bean and gram), various cost concepts were worked out on per hectare basis and presented in Table 4.2 which revealed that the per hectare cost-A<sub>1</sub> on urd bean, mong bean and gram was ₹ 11605.73, ₹ 10840.83 and ₹ 15800.91, respectively. Cost-A<sub>2</sub> on urd bean, moong bean and gram was ₹ 11605.73 /ha, ₹ 10840.83/ha and ₹ 15800.91/ha, respectively. However, cost-A<sub>2</sub> was equal to cost-A<sub>1</sub> as there no rent paid on leased in land in all the three major pulse crops. Cost-B<sub>1</sub> on urd bean, moong bean and gram was ₹ 12049.39, ₹ 11231.71 and ₹ 16289.41 and cost-B<sub>2</sub> was ₹ 17399.39 /ha, ₹ 15835.88 /ha and ₹ 22113.41 /ha,

respectively. The per hectare cost-C<sub>1</sub> was ₹ 15776.96 on urd bean, ₹ 14669.16 on moong bean and ₹ 20154.78 on gram. The per hectare cost-C<sub>2</sub> was ₹ 21126.96 on urd bean, ₹ 19273.33 on Moong bean and ₹ 25978.78 on gram. After working out cost of managerial charges. i.e. 10 percent of cost-C<sub>2</sub>, per hectare cost-C<sub>3</sub> was ₹ 23239.66/ha on urd bean, ₹ 21200.66 /ha on moong bean and ₹ 28576.66/ha.

The overall per hectare returns of urd bean, moong bean and gram were ₹ 32100.00, ₹ 27625.00 and ₹ 34944.00. The benefit cost ratio on the total cost of cultivation was recorded 1.38 in urd bean, 1.30 in moong bean and 1.22 in gram.

## **6.2 Production efficiency**

### **6.2.1 Regression analysis and marginal value productivity of Urd bean on sample farms**

Yield of urd bean was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.88 which is statistically highly significant, meaning that 88 per cent of the total variation is due to above mentioned variables. The regression coefficient of machine labour was found to be significant at 10 per cent level of probability and fertilizer was found to be negatively significant at 10 per cent level of probability and their values were recorded at 0.285 and -0.095, respectively. The regression coefficients of Seed and plant protection chemicals were significant at 5 per cent level of probability. The regression coefficient of human labour was significant at 1 per cent level of probability. The resource use efficiency of machine labour, human labor seed and plant protection chemicals were positive with their values at 3.26, 1.17, 8.00 and 7.70 respectively and the resource use efficiency estimated for fertilizer was negative with their values at -0.095, respectively. There is further scope of increasing the productivity and return by using more machine labour, human labour, seeds and plant protection in urd bean.

### **6.2.2 Regression analysis and marginal value productivity of moong bean on sample farms**

Yield of moong bean was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.95 which was statistically highly significant, meaning that 95 per cent of the total variation was due to above mentioned variables. The regression coefficient of machine labour, fertilizer and plant protection was found to be non-significant. The regression coefficients of seed was found to be significant at 1 per cent level of probability and human labour was found to be significant at 5 per cent level, with their values at 2.70 and 0.98. There is further scope of increasing the productivity and return by using more human labour, machine labour, seed, fertilizer and plant protection in moong bean.

### **6.2.3 Regression analysis and marginal value productivity of gram on sample farms**

Yield of gram was regressed on various factors of production viz., human labour, machine labour, seed, fertilizer and plant protection chemicals. These variables were taken as the explanatory variables. The analysis of crop production function, coefficient of determination ( $R^2$ ) value was 0.97 which was statistically highly significant meaning that 97 per cent of the total variation was due to the above mentioned variables. The regression coefficient of seed was found to be significant at 1 per cent level of probability, machine labour was found to be significant at 5 per cent level of probability and their values were 0.005 and 0.097, respectively. The regression coefficient of human labour and fertilizer were non-significant. The resource use efficiency of plant protection chemicals was found to be negatively significant at 10 per cent level of probability with their value at -4.49. There is further scope of increasing the productivity and return by using more human labour, machine labour, and fertilizer in Gram.

### **6.3 Marketing Channels and marketing efficiency**

The marketing channels of three types mainly (1) producer – village trader-wholesaler-retailer-consumer (2) producer – wholesaler-retailer-consumer (3) producer – consumer, were followed in the sample area. The price received by the producer was found to be ₹ 6400, ₹ 6600 and ₹ 6400 in case of marketing channel-I, II and III respectively. The marketing cost and marketing margin in channel –I, II and III was ₹ 244, ₹ 232, ₹ 5 and ₹ 2912.14, ₹ 2924.14 and ₹2051.14, respectively. The marketing efficiency was found maximum in channel-III (3.11), when the produce was sold directly to consumer. When the produce was sold through intermediaries, the marketing efficiency was lower as it was 2.09 in channel-II and 2.03 in channel-I.

### **6.4 Constraints faced by the producer in production and marketing**

In the production of pluses several constraints such as High labour cost, Unavailability of labour during peak period, involvement of uneducated members in farming, Lack of latest technical knowledge, Lack of finance and credit facilities, Occurrence of diseases & Insect-pest and High cost of pesticides and insecticide.

At marketing level, Lack of remunerative price for the produce was the main constraint and was ranked I by the respondents. Unorganized market, High cost of transportation and Lack of market information were ranked II, III and IV respectively.

### **Conclusion**

Yield/productivity of pulses in Samba district is higher than that of Jammu division as a whole. Yield of pulses grown by the sample farmers in the area under study was higher than that of Samba district. It is true that soil fertility status is not same in the entire district. Yet the difference in yield might have arisen due to other factors like types of package of practice followed by the sample farmers and the other farmers in the district. This indicates the better position of the sample farmers in adopting the improved package of practice in pulses cultivation. This led to higher productivity of the crop. In spite of this, the farmers of the study area faced several problems arising from deficiency in their technical knowledge about growing this crop as expressed by them. This calls for

invigorated agricultural extension service by government and other agencies for the benefits of the farmers growing pulses. Farmers also did not get remunerative price for their output. An efficient marketing system at the behest of the government may solve this problem to some extent. Pulses are widely cultivated in the district under study. A large number of cultivators are engaged in the cultivation of these crops. A portion of their family income comes from these crops enterprise. For smooth cultivation of pulses, supply of necessary inputs including finance is required to be ensured for the farmers.

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# APPENDIX

# SCHEDULES

## 1. General Details:

- 1.1 Name of head of farming Family: .....
- 1.2 Parentage: .....
- 1.3 Village: .....
- 1.4 Post Office: .....
- 1.5 Block: .....
- 1.6 Tehsil: .....
- 1.7 District: .....
- 1.8 Family size: ..... Male Children: ..... Female Children; .....  
Adult Males: ..... Adult Females: .....
- Working force: ..... Males Adults: ..... Female Adult: .....
- 1.9 Educational Level of the head of family: .....
- 1.10 Size of holding (Owned Area): ..... Hectares

Date of survey: .....

Investigator

## 2. Operational holding (area under crops in hectares): .....

S.No.	Particulars	Owned	Leased in	Leased out	Total
i)	Irrigated				
ii)	Un-irrigated				
	Total (i+ii)				

## 3. Area under Major pulse crop of Kandi Belt :

S.No.	Particulars	Owned	Leased in	Leased out	Total
i)					
ii)					
iii)					
iv)					
v)					

**4. Fixed farm Assets:**

S. No.	Particulars	Year of Const./ Purchase	Amount Spent (Rs.)	Present Value (Rs.)	Annual Maintenance Cost (Rs.)
1.	Farm buildings				
2.	Tractor				
3.	Cultivator				
4.	Trolley				
5.	Shed				
6.	Well				
7.	Tube well				
8.	Ponds				
9.	Pump sets				
10.	Power tiller				
11.	Irrigation item (hose pipes)				
12.	Fencing				
13.	Bullock Cart				
14.	Desi plough				
15.	M.B. plough				
16.	Khurpi				
17.	Kudal/ phawda				
18.	Any Others				
19.	(specify)				
20.					
21.					
22.					
23.					
24.					
25.					

**5. Operation-wise Cost on Major pulse :**

S.No.	Operations	Major pulse		
		Man days/ Hours	Rate/day and hours	Cost in (Rs.)
1.	<u>Preparation of Land</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			
2.	<u>Manuring &amp; Fertilizing</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			
5.	<u>Irrigation</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			
6.	<u>Weeding &amp; Pest Control</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			
7.	<u>Harvesting</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			
8.	<u>Threshing &amp; Winnowing</u> a) Human Labour Owned Labour Hired Labour b) Machine Labour Owned Labour Hired Labour			

**6. Material & Inputs Costs:**

S.No.	Material & Inputs	Quantity	Rate	Cost (Rs.)
1.	F.Y.M.			
2.	Fertilizers i) Nitrogenous ii) Phosphoric iii) Potassium			
3.	Seed			
4.	Plant protection chemicals			
5.	Land revenues			
6.	Rental value of leased in Land			
7.	Rental value of owned Land			
8.	Water Cess and Charges			

**7. Details of Outputs and disposal:**

S.No.	Particulars	Main Product		By-Product	
		Qty.(qtl)	Value (Rs.)	Qty.(qtl)	Value (Rs.)
1.	Total Produce				
2.	Home Consumption				
3.	Retained for Seed				
4.	Given as Wages				
5.	Marketable Surplus				
6.	Marketed Surplus				

**8. Market Functionaries of Black gram:**

Total Produce Marketed : ..... Qtls

A) Quantity Sold to Village Traders .....

i) Price per qtl. Received ..... Rs.

ii) Value in Rs,.....

iii) Cost incurred .....

B) Quantity Sold in the Mandi .....

i) Price per qtl. Received ..... Rs.

ii) Value in Rs,.....

iii) Cost incurred .....

C) Quantity Sold to other Agencies (processor) .....

i) Price per qtl. Received ..... Rs.

ii) Value in Rs,.....

iii) Cost incurred .....

D) Sold to Consumer directly .....

i) Price per qtl. Received ..... Rs.

ii) Value in Rs,.....

iii) Cost incurred .....

## **9. Problems & Constraints faced by the sample Growers in production and marketing of Major pulse of *Kandi belt* :**

### **1. Production problems**

- |  |        |
|--|--------|
| i. High labour cost                              | Yes/No |
| ii. Un-availability of labour during peak period | Yes/No |
| iii. Un-availability of good quality FYM in time | Yes/No |
| iv. Occurrence of diseases                       | Yes/No |
| v. High cost of pesticides                       | Yes/No |
| vi. Lack of good quality seed                    | Yes/No |
| vii. Lack of latest technical knowledge          | Yes/No |
| viii. Educated members go outside                | Yes/No |
| ix. Lack of finance and credit facilities        | Yes/No |


### **2. Marketing problems**

- |  |        |
|--|--------|
| i. Not getting remunerative price for the produce        | Yes/No |
| ii. Cheating by middlemen                                | Yes/No |
| iii. High cost of transportation                         | Yes/No |
| iv. High commission charges                              | Yes/No |
| v. Lack of market information                            | Yes/No |
| vi. Un-organised marketing and low price paid to farmers | Yes/No |

# VITA

## CERTIFICATE-IV

Certified that all the necessary corrections as suggested by the external examiner and the Advisory Committee have been duly incorporated in the thesis entitled "Economic Analysis of Production & Marketing of Major Pulse Crops in Kandi belt of Jammu Division of J&K state" submitted by Mr. Akshay Deep, Registration No. J-16-M-458.

 21.01.2019

**Dr. S.P. Singh**  
**Major Advisor & Chairman**  
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Place: Jammu

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