

**PRODUCTION AND MARKETING OF SOYBEAN IN
BELAGAVI DISTRICT OF KARNATAKA - AN ECONOMIC
ANALYSIS**

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ANALYSIS**

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BY

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CERTIFICATE

This is to certify that the thesis entitled "PRODUCTION AND MARKETING OF SOYBEAN IN BELAGAVI DISTRICT OF KARNATAKA - AN ECONOMIC ANALYSIS" submitted by Mr. YOGANANDA. R. E. for the degree of MASTER OF SCIENCE (AGRICULTURE) in AGRICULTURAL ECONOMICS to the University of Agricultural Sciences, Dharwad is a record of research work carried out by him during the period of his study in this university, under my guidance and supervision, and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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Gratitude takes three forms, "A feeling from the heart, an expression in words and a giving in return....."

At last, the moment has come to look into the deeper layers of my heart which is filled with the feeling of togetherness and loveliness; consolation and satisfaction. Some are permanent and some are momentary but both involve a number of persons to whom I acknowledge my warm regards.

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**DHARWAD
JUNE, 2016**

(Yogananda R. E.)

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1. INTRODUCTION

Soybean (*Glycine max* (L.) Merrill.) otherwise known as a 'miracle crop' was originated in China. As early as in 2853 BC, the Emperor Sheng-Nung of China named it as one of the five sacred grains. Thus, soybean has been cultivated in China for more than 4,000 years (Hymowitz, 1970). It is believed that with the development of sea and land trades, soybean moved out of China to nearby countries such as Burma (Myanmar), Japan, India, Indonesia, Malaysia, Nepal, Philippines, Thailand and Vietnam between the first century AD and 1100 AD. However, it remained a minor crop everywhere except in China. With its introduction into USA in the 18th century and its systematic breeding of soybean in that country was transformed from an inefficient fodder type crop to a highly productive erect plant type and USA became the largest producer of soybean in the world ever since 1950s (Hymowitz and Harlan, 1983). Soybean has now become the largest source of vegetable oil and protein in the world. Its large-scale cultivation is concentrated in a few countries such as Argentina, Brazil, Canada, China, India, Paraguay and USA which together produce about 91 per cent of the world's annual soybean production. The origin of soybean's introduction in India is not known but it probably came from China through the Himalayan Mountains centuries ago. The bean is referred to locally as *bhat*, *bhatman*, *bhatmas*, *ramkulthi*, *garakalay* and *kalitur*. Because of its high protein oil content, and other attributes such as its beneficial effects on soil fertility, several attempts were made in the past to popularize soybean cultivation in India, including the initiative taken by Mahatma Gandhi himself in 1935.

Soybean (*Glycine max* (L.) Merrill.) is a major oil seed crop in the world. It is known as golden bean and miracle crop because of its several uses. It has a wide range of geographical adaptation, unique chemical composition, very high nutritional value, functional health benefits and versatile end uses so it has become an important agricultural commodity. Soybean is an excellent source of protein and oil. It contains about 43 per cent of good quality protein, 20 per cent oil, 21 per cent carbohydrates, 5 per cent minerals, 4 percent fibre and reasonable amount of vitamins. Besides utilization of soybean as food, it is also used in oil industry where it occupies first place in world oil production. And third place in domestic oil production. In fact, historically soybean is known as a high protein food. Cereals based Indian diets are generally deficient in protein and calories. Soybean has tremendous potential to meet the protein-calorie malnutrition of the ever increasing Indian population. Soya based food products are also suitable to diabetic patients as they contain less carbohydrates and low cholesterol. Soya protein is also good to people who are allergic to animal protein or milk. Soybean gives 2-3 times more protein yield per quintal than pulses. Therefore it is one of the most economical protein sources in the world.

1.1 Nutritional value

Soybean is a rich source of edible oil containing no cholesterol and very less saturated fats. Soybean oil surpasses all other oils because it is an ideal food for heart patients and those who wish to avoid heart disease. It also contains a large amount of lecithin and a fair amount of fat-soluble vitamins. Lecithin is an important constituent of all organs of the human body and especially of the nervous tissue, the heart and liver. Soybean is, therefore, a good food.

Besides its nutritive quality, functional properties of soy protein have opened avenues for producing new products and improving the quality of existing standard food products. Being a versatile crop with innumerable possibilities, soybean can support many agro-based industries. Soybeans are looked upon not merely as a means of supply of food for humans and animals but, also at the same time to serve as a means for improving the soil through their ability to fix atmospheric nitrogen as a legume, it is an ideal component of a sound agricultural system. It is in the perspective of all these advantages of soybeans and its adaptability and productivity across tropical, subtropical and temperate environments that significant strides have been made in its innovation. In fact, the expansion of soybean across the world has been characterized as one of the striking developments of recent decades.

1.2 Production

Soybean plays a major role in the world food trade. The current global area and production of soybean is around 102.88 million hectare and 239.77 million tonnes respectively. It is a leading oil seed crop in the world, ahead of cotton, rapeseed, groundnut, sunflower etc. the phenomenal increase in its area and production together with the expansion in processing units has earned a prominent position for India on the world map of soybean industry. In fact, it is proved to be a fortune crop in terms of edible oil production, export earnings and rural prosperity.

United States of America is the largest producer. India ranks 5th in the area and production of soybean in the world after USA, Brazil, Argentina and China. These are the five major soybean producing countries, they produce 91 per cent of world's soybean production.

1.3 Indian scenario

India is one among largest producer of Soybean, the current India's area and production are 10.84 million hectares and 14.67 million tonnes respectively. The state Madhya Pradesh has emerged as the soya state of the country. The current area and production are 6031.7 thousand hectares and 7800.1 thousand tonnes respectively in 2012-13 with over 70 per cent share in area as well as in production. The other states which have a substantial area under soybean crop are Maharashtra, Rajasthan, Uttar Pradesh, Haryana, Punjab, Orissa, Karnataka and north eastern states.

It was observed that the price received for soybean compared to each of its competing crops particularly groundnut and cotton seen to be more profitable for farmers particularly in Maharashtra and Madhya Pradesh & Karnataka. Studies revealed that good seeds and better practices could deliver yield of the order of three tonnes per hectare which could place India's total production around 15 million tonnes. Thus, there is ample scope of increasing the production (Kajale, 2002). However, non-availability of short duration high yielding varieties and good quality seed on adequate scale are the major constraint in achieving higher productivity. Limited seed varieties are available and production of quality seed is also limited. Further, low and unbalanced use of chemical fertilizers is another major factor for poor yield of soybean crop. As the country is in short supply of edible oil and about 50 per cent of our edible oil consumption is fulfilled by imports of different vegetable oils. There is a need to promote the production of oilseeds like soybean when compared to other countries. There has been a slow but steady growth in the production of soybean in India which is attributed to erratic monsoon, poor management, incidence of pests and diseases, shattering of pods, soybean rust and above all low input of technology.

1.4 Karnataka scenario

Though soybean crop was introduced in Karnataka during the later part of 1970's, its spread in the State has not remarkable. In Karnataka, around 170 thousand hectare area is under soybean cultivation with a production of 178 thousand tonnes. Soybean has emerged as an important crop in the cropping pattern of Belagavi district of Karnataka. Belagavi district stands first in both area and production followed by Dharwad and Bagalkot. It occupies about 66,769 hectare of area and 41,821 million tonnes of production during 2014-15.

The beans can be processed in variety of ways. Common forms of soy (or soya) include soy meal, soy flour, soy milk, tofu, soy lecithin, soybean oil and textured vegetable protein (TVP). TVP is made into a wide variety of vegetarian foods, some of them intended to imitate meat. Soybeans are the primary ingredient in many processed foods including dairy product substitutes (e.g., margarine, soy ice cream, soy yogurt, soy cheese and soy cream cheese) as well as soy nut butter & soy crisps are among others. Soybeans are processed to produce a texture and appearance similar to other foods (e.g., butter, ice cream, milk, yogurt, cheese, lard, olive oil, ground beef, peanut butter, potato chips etc.) and are readily available in most supermarkets (Ilyas, 2003).

1.5 Belagavi

This district has ten taluks, covering a geographical area of 13,415 square kilometers and stands first place with respect to area in the state. As per the 2011 census, the population of Belagavi district was 47, 79,661. Out of which 24, 23,063 male population and 23,56,598 female population. The climate of the district is generally dry and healthy, except during the monsoon season. The district receives an average annual rainfall of 1,153 millimeters which is uncertain, the temperature ranges from 14 °C to 38 °C. The major soils of these regions are medium to deep black, reddish sandy and red sandy loam. Belagavi district is endowed with semi-geographically advantage and contributes well towards agriculture production. The major varieties grown in study area are JS-335, JS-93, DSB-21.

1.6 Crop potential

The soybean is a bushy, free-branching annual legume. It grows 12 to 36 inches tall. Stems and leaves are hairy. It grows in a wide range of climatic conditions. Soybean grows well in warm and moist climate. A temperature of 26.5 to 30 °C appears to be the optimum for most of the varieties with moderate rains of 400-500 mm, well distributed during growing period of 90-95 days, is quite suitable for its cultivation. The crop grows from mean sea level to as high as 2000 meters. It is cultivated during warm and wet *kharif* season. Soy bean can be grown in almost all types of soil. However, better results are obtained in fertile well drained sandy loam or loam soils of neutral reaction. Water logged areas should be avoided for Soybean cultivation.

In the light of the above facts, the present study entitled on "Production and Marketing of Soybean in Belagavi District of Karnataka—An Economic Analysis" was undertaken with the following specific objectives.

1.7 The specific objectives of the study are as follows

1. To study growth in area, production and productivity of soybean in the Belagavi district.
2. To estimate cost and returns in soybean cultivation.
3. To analyse the resource use efficiency in soybean production.
4. To study the existing marketing channels and work out the producer's share in Consumer's rupee.
5. To identify the constraints associated with soybean production and marketing.

1.8 Hypotheses

1. Area, production and productivity of soybean is increasing.
2. Soybean production is profitable.
3. Resources are optimally used in soybean production.
4. There are few marketing channels in soybean marketing and low producer's share in consumer's rupee.
5. There are few constraints in soybean production and marketing.

2. REVIEW OF LITERATURE

A review of past research helps in identifying the conceptual methodological issues relevant to the study. This would enable the researcher to collect information and subject them to sound reasoning and meaningful interpretation. A brief review of the earlier research work related to the present study is presented in this chapter. Keeping in view the objective of the present investigation the reviews are presented in the following sub heads:

2.1 To estimate growth rate in area, production and productivity.

2.2 To estimate cost and returns.

2.3 To analyse resource use efficiency.

2.4 To identify the marketing channels.

2.5 To identify constraints in production and marketing.

2.1 Trends in area production and productivity of soybean.

Singh and Singh (1997) conducted study on growth rate in area, production and productivity of oilseeds in different states of India using exponential function ($y=ab^t$). The growth rate for area, production and productivity in case of groundnut were 0.8, 1.99, and 1.06 per cent per annum respectively and for rapeseed mustard the growth rate for area, production and productivity was 2.8, 6.04 and 3.16 per cent per annum, respectively. The authors concluded that the growth performance of oilseeds varied from state to state and influenced the overall performance at national level.

Billore and Joshi (1998) studied the growth in area, production and productivity of soybean in India for different states using linear growth equation of the following form $Y=a+bt$, compound growth rate and variability. An attempt was made to examine the effect of area, productivity and their interaction on the total change in the production of soybean and concluded that total change in production was decomposed in area effect, yield effect and their interaction effect and results indicated that soybean cultivation gained popularity in majority of states in India.

Lakhana (2003) has studied the growth rates of area, production and productivity of groundnut in Gujarat for pre-TMO (1970-71 to 1985-86), post-TMO (1986-87 to 2001-02) and for over all period (1970-71 to 2002-02) of selected markets, Rajkot, Junagadh, Kalawad and Amrelin. The post-TMO period has witnessed positive growth rates in area, yield and production. Growth of all the variables were found to be positive in over all period. However they were not significant. Growth rates of area for Junagadh and Rajkot districts as well as for the state of Gujarat as a whole were positive and significant. However growth rates of yield were negative throughout the study area during pre-TMO. During post-TMO growth rates of all variables were found to be positive.

Patidar *et al.* (2006) conducted study on contribution of area and productivity towards growth of soybean production in Madhya Pradesh. The data were collected from office of agricultural statistics Madhya Pradesh, Bhopal. A compound growth rate was used here. The entire period of the study was divided into two sub-periods i e, period I (1984-85 to 1993-94) and period II (1994-95 to 2003-04) the growth in area, production and productivity was positive and significant in all major districts except Betul during the study period.

Lawwa and Kumar (2008) conducted a study on performance of oilseed in Rajasthan. The compound growth rate model was used to study the growth rate for the time period of 1975-76 to 2004-05. The result showed that the different districts of Rajasthan exhibited a positive and significant growth rate of more than 23 per cent in area and production over the entire study period. The study further revealed that improvement in production was due to expansion in area, as contribution of yield to the production was observed insignificant in most of the study period.

Acharya *et al.* (2012) conducted study on growth in area, production and productivity of major crops in Karnataka. The secondary data were collected for a period of 26 years from 1982-83 to 2007-08. Growth rates showed a significant positive growth in area under pulses, vegetables and spices, fruits and nuts, while cereals showed significant negative growth. The growth in area under oilseeds and commercial crops was negative and insignificant. Similarly the production of cereals, pulses, vegetables and fruits showed a significant positive growth. The production of oilseeds and commercial crops registered insignificant positive growth. The productivity of different crops recorded significant growth in the case of cereals, pulses and fruits. Productivity of oilseeds recorded moderately positive growth.

Agarwal *et al.* (2012) conducted study on trends of area, production and productivity of soybean crop in Madhya Pradesh. Present study was based on secondary data and confined to the period of 1996-97 to 2012-13. Compound growth was worked out to estimate the growth in area, production and productivity of soybean crop. The percentage change over the year during the study period for the production of soybean in Madhya Pradesh had a positive value except five years i.e. 1998-99, 2000-01, 2002-03, 2004-05, and 2011-12. This negative growth was mainly due to negative productivity growth. The highest positive growth was observed in 2003-04 i.e. 74.01 per cent which was highly attributed by productivity growth (73.11 %) and contribution of area growth was negligible for the same i.e. 0.52 per cent.

Dupare *et al.* (2014) conducted study on contribution of area, productivity and their interaction towards changing oilseeds and soybean production scenario in India. The study is based on time series secondary data (1951-52 to 2010-11) on area, production and productivity for the nine oil seeds and (1970-71 to 2011-12) for soybean. This study employed decomposition model to analyse the contribution of area, production and productivity. The study revealed that there is a relative increase in area, production and productivity of nine oilseeds has been 129, 518 and 170 per cent over the last 60 years, while in case of soybean the annual increment in area was 20 per cent and 29.82 per cent in case of productivity.

Naidu *et al.* (2014) attempted to study the trends in area, production and productivity of selected oilseed crops in Andhra Pradesh and also in Chittoor District of Andhra Pradesh. The study revealed that area, production and yield under groundnut and sesame decreased during the study period from 1996-97 to 2011-12 in Andhra Pradesh and noticed that the growth rate of area under groundnut and sesame was negative at -3.23 -7.60 per cent respectively implying that the area under groundnut and sesame crops had been decreasing year by year.

2.2 The cost and returns in the production

Kulkarni (1999) conducted a study on production, marketing and processing of soybean in Belagavi district of Karnataka. He worked out the total cost incurred in processing of soybean at ₹ 10,404,47 per tonnes out of which 96.6 per cent was variable cost and 3.4 per cent was fixed cost. The gross returns per tonnes of oil was ₹ 2,900 and oil cake ₹ 7,000 per tonnes. The net returns per tonnes of output was ₹ 665.53. The B : C ratio for the unit was 1.06.

Naik *et al.* (2006) studied that the costs and returns of groundnut crop in Hinjilicut block of Orissa. The study observed that the operating cost of groundnut during *kharif* was found to be higher than the *rabi* among marginal, small and large farmers, the benefit cost ratio based on total operating cost (variable cost) was 0.49 and 0.98 respectively. For *kharif* and *rabi* groundnut it indicates that the cultivation of groundnut was not profitable but the farmers grew these crops for employment in absence of other alternative opportunities.

Dudhati and Khunt (2007) conducted study on economics of production and marketing of groundnut seeds in junagadh district of Gujarat. The study revealed that the total cost of cultivation of groundnut seeds was ₹ 19,129 per ha. And ₹ 1,465.82 per quintal. While the net income was ₹ 8,131.04 per ha, ₹ 623.95 per quintal. The ratio of input- output was more than one (unity).

Meena (2009) conducted study on an analysis of production and marketing of rapeseed-mustard in selected districts of Rajasthan. The details pertaining to costs of rapeseed-mustard cultivation in Alwar and Sri Ganganagar districts were analysed by tabular presentation. The results of the study revealed that total variable cost was 71.73 per cent and its value was 15,328.77 and total fixed cost was 28.27 per cent its value was 6,042.10, benefit cost ratio for cost A1 was 2.64, for cost A2 was 2.64, for cost B1 was 2.39, for cost B2 was 1.98, for cost C1 was 1.96, for cost C2 was 1.67.

Dinesh (2011) conducted study on production and value addition to groundnut in Chitradurga district of Karnataka. The Study conducted on costs and returns of groundnut production the results revealed that per hectare 99.6 per cent chemical fertilizers are higher compared to 86.9 per cent of seed, 8.5 per cent for bullock, labour, human labour 4.5 and machine labour 5.5 and last FYM (farm yard manure) 3.5 out of sample size 90.

Kumara *et al.* (2012) conducted study on costs and returns of major cropping systems in northern transition zone of Karnataka. A sample size of 160 farmers were selected using multiple stage random sampling method. Tabular analysis was employed. The results revealed that, maize + redgram, sorghum+ redgram, greengram + redgram and soybean were the major cropping systems identified. The net returns over total costs in these major cropping systems were ₹ 22,513, ₹ 24,659, ₹ 12,507 and ₹ 13,719 respectively. Returns per rupee of expenditure was found to be the highest in cropping system - II (sorghum+ redgram).

Ahiwar *et al.* (2014) conducted study on economics of soybean cultivation and analysis of production constraints in central narmada valley of Madhya Pradesh. The study was based on primary data collected from 100 cultivators. Multistage random sampling design was followed for sample selection of the study. The cost of soybean cultivation in case of medium farms was found to be higher (₹ 26,253 / ha) in comparison to small farms (₹ 24,623 / ha) and large farms (₹ 24,536 / ha). The maximum gross income from soybean cultivation observed on medium farms (₹ 41,130 / ha) followed by small (₹ 38,989 / ha) and large (₹ 37,902 / ha) farms.

2.3 Resource use efficiency in Soybean production

Biradar (2007) in his study on economics of redgram based cropping systems in Bidar district (redgram with jowar, black gram, green gram, soybean and redgram sole). Here resources had positive and significant influence on gross returns, bullock labour, machine labour & plant protection chemicals were over utilized and seed, farm yard manure and fertilizer were underutilized. The adjusted coefficient of multiple determination was 0.66 and production function fitted showed increasing returns to scale.

Taru *et al.* (2008) conducted a study on economic efficiency of resource use in groundnut production in Adamawa State of Nigeria by collecting data with 143 farmers using a simple random technique. The regression analysis indicated that the Cobb- Douglas function gave the best fit. The R^2 (0.78) was highly significant at one per cent level. Three out of the eight independent variables were significant at one per cent level, these were farm size, seed and labour input, they positively affect the groundnut indicating that the more the farm size, quantity of seed and labour used, the more will be the output. Economic efficiency of resource use showed the seed and labour were underutilized, while fertilizer and agrochemicals were over utilized.

Arti and Jyoti (2009) studied resource use efficiency and sustainability of maize cultivation in Jammu and Kashmir region. Multistage random sampling was adopted for selection of 120 sample households. Cobb Douglas production function was employed for analysis. Study revealed that seed, urea, potash, manure, human labour and capital were included in the model which explained 51 per cent variation in the maize production, and maximum sample farmers were used local seed and only 22 per cent of the farmers purchased hybrid seeds in the study area.

Asmatoddin *et al.* (2009) made a study of resource productivity. Resource use efficiency and optimum resources used with respect to various explanatory variables in pulse crops pigeon pea and green gram was undertaken on medium farm during agricultural year 2005-06 in Marathwada region of Maharashtra. The data was taken from cost of cultivation scheme Marathwada Agricultural University, Parbhani the sample of 100 medium farm size farmers throughout the zone was tabulated and analyzed by appropriate statistical tools. The results revealed that, in case of pigeon pea, area and bullock labour was positive and significant at one and five per cent level, respectively. Coefficient of multiple determination was (R^2) 0.70 which indicated 70 per cent variation in independent variable, the sum of elasticity was 0.83 which indicated that decreasing returns to scale. With regard to green gram area was positive and significant at one per cent level, the sum of elasticity was 1.01 % which indicated increasing returns to scale coefficient of multiple determination was 0.86 which indicated that 86 per cent variation in explanatory variable was with the listed independent variable.

Kiresur and Ichangi (2011) conducted a study on socio-economic impact of Bt cotton in Karnataka. Multistage random sampling technique was employed to select 60 sample farmers. Cobb-Douglas production function was fitted to assess the resource use efficiency. Results of the study revealed that average expenditure on seed was higher in Bt cotton than non-Bt cotton. Quantity of organic manure used in Bt (6.5 / ha) and non Bt (6.7 / ha) farmers was almost same. But cost incurred on chemical fertilizers and organic manures was higher in non-Bt than Bt farmers. The use of labour was more on non-Bt than Bt farmers. It was due to more number of sprays for pest management on non-Bt cotton, which added to the cost on human labour.

Karthick *et al.* (2013) conducted a study on resource use efficiency and technical efficiency of turmeric production. Data were collected from 90 turmeric growers spread over three blocks in Dharmapuri district of Tamil Nadu. The study revealed that planting material, nitrogen, potash, harvesting, curing cost, machine hours and irrigation had a positive and significant influence on turmeric yield. Economic efficiency of these variables, except harvesting and curing cost, was more than one, indicating that these resources were used at sub-optimum levels and there existed the possibility of enhancing the yield of turmeric by increasing their use. The technical efficiency of about 69 per cent of sample farmers had been found more than 80 per cent, which indicated the possibility of increasing the yield of turmeric by adopting better technology.

2.4 To identify the channels of marketing of soybean and analysis of producer's share in consumer's rupee

Agarwal and Sharma (1994), conducted study on soybean marketing problems in Rajasthan. Identified five marketing channels which are as follows:

Channel –I: producer- seller → oilseed grower's cooperative society → Tilham sangh.

Channel- II: producer- seller → commission agent → Tilham sangh.

Channel- III: producer- seller → commission agent → local processor.

Channel –IV: producer- seller → commission agent → wholeseller → local processor.

Channel –V: producer-seller → commission agent → wholeseller → outside processor.

Producer farmer got the highest net price of ₹ 668.56 per quintal through the sale of soybean (96.22 % of processor's price) when marketed their produce in village itself (channel-I). In all other channels farmers got lesser price by ₹ 10 to 15 per quintal than when they got in the channel- I. producer's share ranged between 86 to 92 per cent in these channels. Marketing costs ranged from 3.78 per cent in channel-I to around 8 to 10 per cent in other four channels. The wholesalers got a margin of ₹ 30.56 per quintal through the sale of soybean 94 per cent share in price paid by the processors)

Sharma *et al.* (2002) estimated a study on production and marketing of rapeseed mustard in block Akbarpur, district Kanpur of Uttar Pradesh. The study identified three marketing channels. The highest quantity of rapeseed mustard was sold through channel III with the price spread of 45.86 per cent and 21.14 per cent in channel II.

Banafar *et al.* (2006) studied marketing of rapeseed mustard in Surguja district of Chattisgarh. They identified three marketing channels for rapeseed mustard grains in Ambikapur. The study concluded that the sale price of producer came to ₹ 1,175, ₹ 1,300 and ₹ 1,225 in channel I, II and channel III respectively. The producer's share in consumer's rupee was the highest being 72.22 per cent in channel II followed by 68.17 and 63.92 per cent in channel I & III respectively.

Gauraha *et al.* (2007) studied on marketing of soybean in Sehore district of Madhya Pradesh. Data were obtained from 120 soybean farmers as well as from market intermediaries and processors to examine the marketing patterns, costs and margins for soybeans. Three channels of marketing of soybeans were identified: (1) through village merchants and wholesale dealers; (2) through cooperative societies; and (3) through wholesale dealers in regulated markets. Total marketing cost was the highest on channel I (₹ 202.52) and lowest on channel II (₹ 160.40). The producer's share in the consumer's price was almost similar in channel II and III.

Raghuwanshi *et al.* (2007) identified three marketing channels and price spread for soybean in Sehore district of Madhya Pradesh *viz.*

Channel I: Producer → Village merchants → Wholesaler dealer in regulated market (grain) → Processors → Refiner → Wholesaler (oil) → Retailer (oil) → Consumer.

Channel II: Producer → Wholesaler dealer in regulated market (grain) → Processors → Refiner → Wholesaler (oil)-Retailer (oil) → Consumer

Channel III: Producer → ITC company → Processors → Refiner → Wholesaler (oil) → Retailer (oil) → Consumer.

The study revealed that producer's share in consumer's rupee in channel III was (73.33 %) followed by channel II (72.85 %) and channel I (71.88 %). This indicated that with the increases in the number of market functionaries in the market process leads to reduction in the producer's share in consumer's rupee.

Meena (2009) conducted a study on economic analysis of production and marketing of rapeseed mustard in selected districts of Rajasthan. He studied marketing channels and price spread of rapeseed and the important channels identified. The most important intermediary through whom bulk of the produce reached the oil miller from the producer was commission agents accounting 39.09 per cent of the total marketed surplus followed by wholesalers 27.15 per cent, village traders 19.59 per cent and processors 14.16 percentage. The marketed surplus in Alwar district was more than to Sri Ganganagar district. The proportion of marketed surplus to total quantity produced formed 92.15 per cent and 89.47 per cent respectively in Alwar and Srinagar districts.

Srivastava *et al.* (2010) studied on Economic analysis of marketing of soybean in Mandsaur district of Madhya Pradesh. A multistage stratified random sampling used to select the respondents. They identified three marketing channels were

Channel I: Producers → Village merchant → Wholesale dealers → Processors → Wholesale dealers of Soybean oil (Refiners) → Retailers of Soybean oil → Consumer

Channel II: Producer → Co-operative societies → Processors → Wholesale dealers of Soybean oil (Refiners) → Retailers of Soybean oil → Consumer

Channel III: Producer – Wholesale dealers in regulated market → Processors → Wholesale dealers of Soybean oil (Refiners) → Retailers of Soybean oil → Consumer

The study revealed that producer's share in consumer's rupee was maximum in channel-II (59.63 %) followed by channel-III (59.18 %) and channel-I (54.13 %) respectively. The marketing efficiency index was the maximum in channel-II (2.44) followed by channel-III (2.44). The lowest marketing efficiency was found in channel-I (2.18).

Farkade *et al.* (2011) studied the economic analysis of production and marketing of soybean in Vidarbha region of Maharashtra. The study revealed that producers share in consumers rupee was highest in channel II (34.35 %) followed by channel III (33.74 %) and channel I (32.85 %), respectively. The marketing efficiency of marketing channel I, II and III was 1.13, 1.12 and 1.15 per cent respectively, it indicated that the efficiency was more or less same across the three channel.

Singh *et al.* (2014) conducted study on Marketing of rapeseed-mustard in Bharatpur district of Rajasthan. The present study was conducted to study the costs, margins, price spread, marketing of rapeseed-mustard in Rajasthan, Bharatpur district was selected. Producer's share in consumer's rupee was around 90 per cent in to channels of marketing. There was no significant difference in the price received by producer-sellers in absolute as well as in percentage term in different channels of marketing. The marketing costs ranged from ₹ 138.03 (7.16 %) to ₹ 138.00 (7.16 %) of consumer's rupee in different channels of marketing. Marketing margins ranged from 2.58 to 2.60 per cent of consumers rupee in different channels of marketing. It appears that the margins in rapeseed-mustard marketing in the Bharatpur district of Rajasthan are not excessively high.

2.5 Production and marketing problems of Soybean.

Kulkarni (1999) estimated a study on production, marketing and processing of soybean in Belagavi district of Karnataka. The study revealed that, the major problems faced by the farmers in marketing of soybean were, high transportation cost (77 %) followed by price fluctuation (74 %), delayed payments (54 %), lack of processing units (20 %) and high commission from market intermediaries.

Reddy and Reddy (2005) conducted a study on production and marketing constraints of sunflower cultivation in Andhra Pradesh. The study observed that majority of small farmers (93.33 %) and large farmers (86.66 %) felt that cost of fertilizer was high, 88.33 per cent of the sample farmers opined that the seeds were costly 80 and 70 per cent of small and large farmers opined that cost of labour was high. With respect to problems of marketing, the cash payment by the commission agent was a problem faced by respondents. Majority of small farmers (78.33 %) expressed their inability to store the produce when prices offered were low due to lack of storage facilities.

Grover and Singh (2007) conducted a study on sesamum cultivation in Punjab. The constraints observed were problem of irrigation and shortage of labour faced by the sesamum growers. The shortage of labour was perceived by nearly 26 per cent farmers as moderate and by only 8 per cent farmers as severe. The availability of fertilizer, insecticide, credit were not serious problems. Major marketing constraints expressed by sesamum growers were price variability, lack of price information, lack of storage, lack of transport and low market demand were major problems faced by farmers.

Raghuwanshi *et al.* (2007) conducted study on price spread and constraints in marketing of soybean in Sehore district of Madhya Pradesh. The study concluded that high transportation costs, low prices for soybean during peak period, lack of knowledge about warehouses, and lack of producers organization. These were the major problems faced by the most of the farmers.

Meena (2009) conducted an economic analysis of production and marketing of rapeseed mustard in selected districts of Rajasthan. They uses correlation analysis to analyse the nature of integration among the selected markets in Rajasthan and found that lack of technical guidance, non-availability of fertilizer on time, high costs of labour and inadequate credit supply were major problems. Lack of Price information, delayed payments and lack of storage facilities were the problems related to marketing and they suggested that APMC should have strict regulation of practices to ensure prompt receipts for sale proceeds by the farmers.

Srivastava *et al.* (2010) made a study on economic analysis of marketing of soybean in mandasaur district of Madhya Pradesh. Study concluded that the soybean growers were deprived of their due share in consumers rupee because the producers were forced to sell their produce to intermediaries under financial obligations. Lack of storage and warehouses facilities, price fluctuation, high transportation charges, and malpractices in market were the market related problems.

Ahiwar *et al.* (2014) conducted study on economics of soybean cultivation and analysis of production constraints in central narmada valley of Madhya Pradesh. The study was based on primary data collected from 100 cultivators. Multistage random sampling design was followed for sample selection. The study revealed that lack of hired human labour during peak operational periods was the main constraint in the study area in cultivation of soybean as reported by 74 % of cultivators, non-availability of soil testing facilities (72 %), high cost of inputs (70 %), lack of knowledge on plant protection measures (63 %), inadequate capital (54 %), timely non-availability of quality seed of improved variety (53 %) were the problems.

3. METHODOLOGY

This chapter deals with the description of the study area, the sampling procedure followed, the nature and sources of data collected and analytical tools and techniques employed in the study. A few concepts used in the present study are defined and explained to facilitate a clear understanding of issues concerned with present study. The details of this chapter are presented under the following major sub headings:

- 3.1. Description of the study area
- 3.2. Sampling design
- 3.3. Nature and sources of data
- 3.4. Analytical tools and techniques employed
- 3.5. Definition of terms and concepts used

3.1 Description of the study area

An assessment of any development activity can be made only with a detailed understanding of the physical, natural characteristics and socio-economic status of the region. Hence, an attempt has been made to describe the physical, natural and socio-economic features of Belagavi district of Karnataka (Fig. 1).

3.1.1 Karnataka state

Karnataka state is situated in West Central part of the peninsular India. It consists of a narrow elongated belt between the Arabian Sea and Western Ghats and enhancing coastline of about 400 km. The state has an area of 1,19,257 sq. km and is situated between 115°19' North latitude and 74°78' East longitudes. The state is bounded by Maharashtra on the north and by Goa and Arabian Sea on the west. It has a common border with Andhra Pradesh on the east and Tamil Nadu and Kerala on the south. The average rainfall of the state is 1,139 mm. The state receives rainfall both from southwest and northeast monsoons. The mean temperature ranges from 21.5 °C to 31.7 °C.

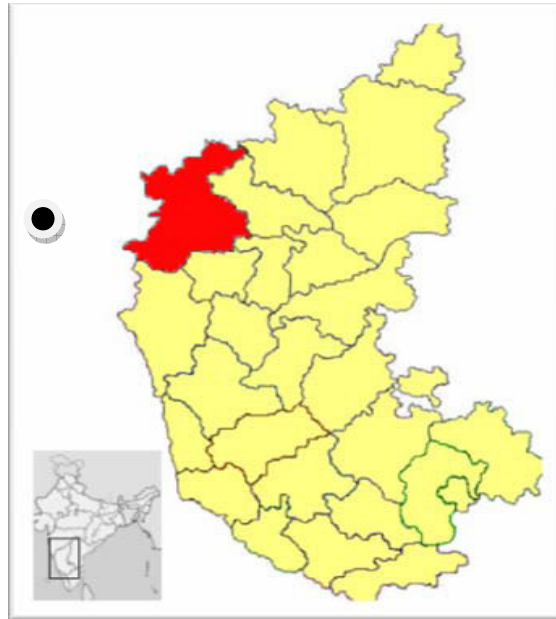
3.1.2 Belagavi district

The present study was conducted in Belagavi district, Northern part of Karnataka which comes under Northern transitional zone. Belagavi district consists of ten taluks namely Athani, Bailhongal, Belagavi, Chikkodi, Gokak, Hukkeri, Khanapur, Raibag, Ramdurg and Savadatti. Belagavi district is located at North–West region of Karnataka state between 15-23° to 16-58° N' latitude and 74.05° to 75.28°E longitude. It is surrounded by Bijapur, Bagalkot, Dharwad and Uttar Kannda Districts of Karnataka and Sangli, Kolhapur and Ratnagiri Districts of Maharashtra.

3.1.3 Agro-climate features

The total geographical area of the district is 13,415 square kilometers which stands first place with respect to area in the state. The major rivers flowing in the district are Krishna, Malaprabha and Ghataprabha. The main irrigation sources for the district are canals followed by wells, bore-wells and lift irrigation.

Karnataka state



Belagavi district

Belagavi District



Selected taluks

Fig. 1. Map showing study area

3.1.4 Soils

Geographically the district is divided into three zones, *i.e.*, 1.Hilly zones, 2. North semi malnad zones, 3. Northern dry zone. The Khanapur taluk lies under Hilly zones, Chikkodi, Hukkeri, Bailhongal and Belagavi taluks fall under North semi-malnad zones,, while Athani, Raibag, Gokak, Ramdurg and Savadatti taluks fall under the north dry zones. The major soils of these regions are medium to deep black, reddish sandy and red sandy loam.

3.1.5 Climate

The climate is generally dry and healthy, except during the monsoon season. The hot season begins by March with the maximum temperature of 38°C and minimum temperature of 14 °C during December, which is generally the coldest month.

3.1.6 Rainfall

The district receives an average annual rainfall of 1,153 millimeters which is uncertain, as well as erratically distributed. In the district, Gokak taluk receives a lowest average annual rainfall of 425.7 millimeters and Khanapur taluk receives the highest average annual rainfall of 2,969.4 millimeters (2011-12).

3.1.7 Demographic features of the study area

As per the 2011 census, the population of Belagavi district was 47,78,439 with literacy rate of 64.57 per cent, out of which male literacy was 72.19 per cent and female literacy was 56.70 per cent.

3.2 Sampling procedure

3.2.1 Selection of the study area

Belagavi district is the major soybean producing area in Karnataka, The total area and production of soybean were 66,769 ha and 41,821 million tonnes respectively during 2014-15. The taluk wise area of soybean in Belagavi district was given in table below.

Taluk wise area under soybean in Belagavi district 2013-14

| Sl.No | Taluk | Area (ha) |
|-------|------------|-----------|
| 1 | Athani | 2,407 |
| 2 | Bailhongal | 29,885 |
| 3 | Belagavi | 3,836 |
| 4 | Chikkodi | 11,343 |
| 5 | Gokak | 2,103 |
| 6 | Hukkeri | 12,498 |
| 7 | Khanapur | 0 |
| 8 | Raibag | 1,210 |
| 9 | Ramadurg | 2,030 |
| 10 | Savadatti | 1,457 |
| | Total | 66,769 |

Source: Belagavi district at a glance, area for the year 2013-14

Districtwise area, production and productivity of soybean in Karnataka 2014-15

| District | Area (ha) | Production (t) | Productivity (kg/ha) |
|----------------|-----------|----------------|----------------------|
| Belagavi | 66,769 | 41,821 | 626 |
| Vijayapura | 285 | 0 | 0 |
| Dharwad | 21,270 | 17,757 | 834 |
| Haveri | 6,046 | 6,024 | 996 |
| Uttara Kannada | 4 | 0 | 0 |
| Bellary | 23 | 0 | 0 |
| Bidar | 77,186 | 87,640 | 1,135 |
| Kalaburgi | 4,125 | 320 | 775 |
| Chikkamagaluru | 5 | 1 | 1,063 |
| Mandya | 4 | 1 | 1,063 |
| Tumakuru | 4 | 1 | 1,063 |
| Bagalkot | 12,526 | 2,636 | 917 |
| Remaining | 0 | 0 | 0 |

Source: Karnataka at a glance – 2014-15

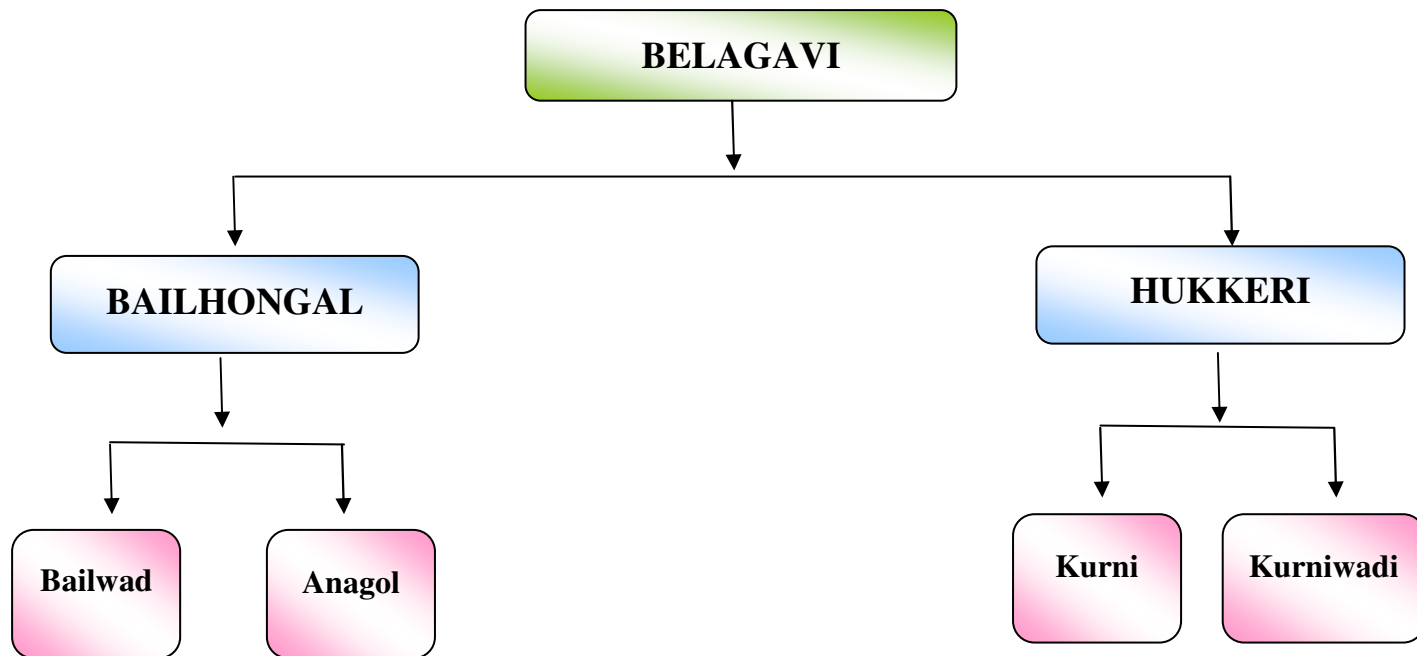
3.2.2 Sample size

The multi-stage random sampling procedure was adopted to choose the sample farmers (respondents). In the first stage, Belagavi district was selected based on highest soybean area. In second stage, taluks having highest area under soybean were selected. Later, based on area and convenience two villages from each taluk were selected in the third stage. Finally, sample of thirty farmers were chosen from each of these selected villages randomly to elicit the required information. Further two markets were selected from each taluk and five intermediaries from each market were selected for enumerating the data. Thus sample size is 20. Thus, the total sample size selected for the present study was 140. The details sampling design is presented in Fig. 2.

3.3 Nature and Sources of data

Keeping in new the specific objectives of the study, both primary and secondary data were collected. Primary data relating to costs, returns involved in production and marketing of soybean were obtained from the selected farmers. For this purpose, pre-tested and well-structured schedule was used to obtain required information from farmers and market intermediaries.

Secondary data about area, production and other useful information for the study was collected from concerned government statistical sources like Directorate Economics and Statistics and District Statistical Office, Belagavi. 2014-15.



[(4 (villages) x 30 (farmers) = 120 farmers in total)

Fig. 2. Sample design

3.4 Analytical tools and techniques employed

The analytical techniques used to evaluate the objectives of the present study are summarized below.

3.4.1 Growth rate

In order to analyze growth in area, production and productivity of soybean, compound growth rate is estimated using the function as under.

$$Y = a b^T e^u \dots\dots\dots (1)$$

Where,

Y = Dependent variable (area/productivity / production)

a = Intercept term

b = (1+r) and r is the compound growth rate

T = Time

e^u = error term

In the logarithmic form the function could be expressed as,

$$\text{Log } Y = \text{log } a + T \text{ log } b + u \dots\dots\dots (2)$$

Log a and Log b were obtained using the Ordinary Least Squares (OLS) procedure and (Antilog of log (b - 1)) *100 gave the per cent growth rate.

3.4.2 Tabular presentation techniques

The data collected were presented in tabular form to facilitate easy comparisons. The tabular presentation technique was followed to study the economic characteristics, such as size of land holding, cropping pattern, costs and returns in relation to production of soybean and for analyzing the data elicited through opinion survey from the sample respondents.

The data were summarized with the aid of statistical tools like averages and percentages to obtain the meaningful results.

3.4.3 Functional analysis

The Cobb-Douglas type of production function was used to study the effect of various inputs on soybean output. On account of its well-known property of its computational simplicity, justifies its wide application in analyzing production relations. It is a homogenous function provided a scale factor enabling one to measure the returns to scale. The estimated regression coefficients represented the production elasticities.

The form of Cobb-Douglas type of production function used in the present study is as follows.

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} e^u \dots\dots\dots (3)$$

Where,

Y = Gross Returns (₹/ha)

a = Intercept (efficiency) term

X₁ = Expenditure on seeds (₹/ha).

X₂ = Expenditure on Farm Yard Manure (FYM, ₹/ha).

X₃ = Human labour expenditure (₹/ha).

X₄ = Bullock labour expenditure (₹/ha).

X_5 = Machine labour expenditure (₹/ha).

X_6 = Expenditure on fertilizers (₹/ha).

X_7 = Expenditure on Plant Protection Chemicals (PPC, ₹/ha).

e^u = Error term

b_i 's = Output elasticities of respective factor inputs, $i = 1, 2, \dots, 7$ and

The Cobb-Douglas type of production function was converted into log linear form as given below and parameters (coefficients) were estimated by employing Ordinary Least Square Technique (OLS) as given below.

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + u \log e \quad (4)$$

3.4.3 Allocative efficiency

Given the technology, allocative efficiency exists when resources are allocated within the farm according to market prices which implies the proper level of input use in production. To decide whether a particular input is used rationally or irrationally, its marginal value products (MVP) would be computed. If the Marginal Value Product of an input just covers its acquisition cost it is said that is used efficiently.

The MVP was calculated at the geometric mean levels of variables by using the following formula.

$$\text{MVP } i^{\text{th}} \text{ resource} = b_i * \frac{\bar{Y}}{\bar{X}}$$

Where,

\bar{Y} = Geometric mean of the output

\bar{X}_i = Geometric mean of i^{th} input

b_i = the regression coefficient of the i^{th} input

A ratio of the value of marginal product to the factor price was compared and if it is more than unity implied that the resources were advantageously employed. If the ratio was less than one, it suggested that resource was over utilized.

The criterion for determining optimality of resource use was,

MVP/MFC > 1 underutilization of resources

MVP/MFC = 1 optimal use of resources

MVP/MFC < 1 excess use of resources.

3.5 Definition of terms and concepts used in the study

3.5.1 Costs

The total cost (TC) was divided into two broad categories *viz.*

3.5.1.1) Variable costs and 3.5.1.2) Fixed costs

3.5.1.1) Variable costs: The variable costs include cost on seeds, manures, fertilizers, wages of human and bullock labour, plant protection chemicals, irrigation charges and interest on working capital. The computations of different terms of variable cost components are as follows:

3.5.1.1.1) Seeds: The cost of purchased seeds was based on the actual amount paid by the respondents. The farm-produced seeds were imputed based on the prices, which prevailed at the time of sowing.

3.5.1.1.2) Farm Yard Manure (FYM): The value of FYM generated on their farm was imputed by considering the rates prevailing in the locality for per tractor load at the time of its application.

3.5.1.1.3) Fertilizers and Plant Protection Chemicals (PPC): The cost of fertilizers and plant protection chemicals was based on the actual prices paid by the sample respondents including the cost of transportation and other incidental charges, if any.

3.5.1.1.4) Labour: The cost of hired labour was calculated at the prevailing wage rates paid per day (eight hours) in the study area for men, women and bullock pairs during the study period. The same wage rates were imputed for family labour. While expressing labour in mandays, women days were converted into mandays by taking 1.33 women days equal to one manday. Woman labour was converted into male equivalents. The formula used for conversion was Male equivalents of female labour = 0.65 x total number of female labour days Conversion factor 0.65 was taken based on the ratio of wage paid to the men labour Vs women labour.

3.5.1.1.5) Interest on working capital: This was calculated at the rate of 8 per cent for the three months on the total value of the seeds, manures, fertilizers, plant protection chemicals, human labour, bullock labour, machine labour and materials (based on the interest rates charged by financial institutions).

3.5.1.2) Fixed costs: The fixed cost includes depreciation on farm implements and machinery, interest on fixed capital, land revenue and rental value of land.

3.5.1.2.1) Depreciation charges: Depreciation rates, life span and junk value for various agricultural implements and consequently, the depreciation was calculated using the straight-line method.

Depreciation = Purchase value - Junk value / life span The depreciation charges were allocated to different crops cultivated during the year in proportion to the area under each crop.

3.5.1.2.2) Interest on fixed capital: Interest on fixed capital was calculated at the rate of 12 per cent, as the fixed deposits in commercial banks and private banks would fetch this rate of interest. The items considered under fixed capital were implements and machinery. Interest was considered on the value of these assets after deducting the depreciation for the year. No interest was charged on the land value since the rental value of owned land was considered. Then the amount so calculated was apportioned to the crop acreage based on duration of the crop.

3.5.1.2.3) Land revenue: Land revenue was taken at the rates levied by the government (₹ 50 / ha).

3.5.1.2.4) Rental value of land: Rental value of land was calculated at the prevailing rate per acre per annum in the study area and was apportioned to the respective crop.

3.5.2) Returns

1. Gross returns per rupee of investment = Gross returns / Total cost

2. Cost of production (quintal) = Total cost (/ ha) / yield (q / ha)

3. Gross returns per quintal = Gross returns (/ ha) / yield (q / ha)

4. Net returns over variable cost: This can be obtained by deducting total variable cost from gross returns and is denoted as;

Net returns over variable cost = Gross Returns – Total Variable Cost.

5. Net returns over total cost/ Net returns: Net returns over total cost were worked out by deducting total cost (TC) of production from gross returns.

Net returns over total cost = Gross Returns – Total Cost

6. Cost of production per kg: This was worked out by dividing total cost (TVC) by yield of main product.

Cost of production per kg = Total Cost / yield of main product

7. Benefit Cost Ratio: This was worked out by dividing gross returns by total cost.

Benefit Cost Ratio = Gross Returns / Total Cost

3.5.3) Cropping pattern

The proportion of the area under various crops at a point of time (kharif, rabi Summer and bi season) represents the cropping pattern.

3.5.4) Cropping Intensity (CI)

Cropping intensity was computed as the ratio of the gross cropped area to the net sown area and expressed in percentage.

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net cropped area}} \times 100$$

3.5.5) Small farmer

A farmer holding a land less than 2 ha fall under this category.

3.5.6) Medium farmer

A farmer holding a land 2-4 ha fall under this category.

3.5.7) Large farmer

A farmer holding a land more than 4 ha falls under this category.

3.5.8) Marketing definitions

3.5.8.1) Price Spread

The difference between the price paid by consumer and price received by the producers is the marketing margin or price spread.

3.5.8.2) Marketing Channels

Marketing channels are defined as the routes through which the producer sellers dispose-off their produce. Three main channels were noticed in the area, where farmers while selling their soybean outputs adopted these marketing channels.

They were:

Channel-I: Producer → Village Merchant → Wholesaler → Processor (consumer)

Channel-II: Producer → APMC → Wholesaler → Processor (consumer)

Channel-III: Producer → Village Merchant → Processor (consumer)

3.5.8.3) Commission Agent

Commission agent is a person who operates in the regulated market on behalf of producer-seller and purchasers (wholesale trader). He receives commission (from purchaser) at a fixed rate on

the amount involved in each transaction from a trader and is responsible for disbursement in each transaction, sales proceeds (to seller) received from buyers.

3.5.8.4) Wholesale Trader

Wholesale trader is a person who buys the notified agricultural / horticulture products in the market yard either for himself or on behalf of others for the purpose of reselling the same either in the original form or after processing.

3.5.8.5) Village Merchant

Village merchant may be described as a person who purchases the agricultural/horticultural produce in village directly from the producers for the purpose of subsequent selling.

3.5.8.6) Marketing Costs

Marketing costs are the actual expenses incurred in bringing goods and services from the producer to the consumers.

3.5.8.7) Marketing Margins

Margin refers to the difference between the price paid and received by a specific marketing agency such as a single retailer, or by any type of marketing agency, i.e. retailers or wholesalers or by any combination of marketing agencies in the marketing system as a whole. Total marketing margin includes cost involved in moving the soybean produce from producer to consumer and profits of various market functionaries. The absolute value of the total marketing margin varies from market to market, channel to channel and time to time.

3.5.8.8) Commission Charges

It is a amount of margins given to the different sources for raw materials particularly in case of non-registered dealers.

3.5.8.9) Miscellaneous Charges

In addition to above costs, some other charges are also levied. These include handling, weighing, loading, unloading, cleaning, charity contribution in cash and kind. These charges may be payable either by the sellers or by the buyers.

3.5.9.0) Marketing Costs of the Producer-Seller (MCP)

It comprised of cleaning and packing cost, loading and unloading charges, transportation cost, commission paid and weightment charges.

3.5.9.1) Producer's Net Price (PNP)

This was the difference between the price received (PR) and marketing cost incurred (MC) by the producer. $PNP = PR - MC$

3.5.9.2) Producer's share in the consumer's rupee (PSCR)

Producer's net price (PNP) expressed as a percentage of the retail price (RP) is defined as producer's share in the consumer's rupee. $PSCR = PNP / RP \times 100$

3.5.9.3) Marketing efficiency: Modified marketing efficiency (ME) formula as given by Acharya and Agarwal (2001) was used to compute marketing efficiency Nets price received by the producer
Marketing efficiency = Total Marketing cost + Total Marketing Margin + Marketing loss.

4. RESULTS

The results obtained from the rigorous Economic analysis of the data are presented under the following sub-headings:

- 4.1 Socio-economic characteristics of the respondents.
- 4.2 Compound growth rates of area, production and productivity.
- 4.3 Costs and returns in soybean production.
- 4.4 Resource use efficiency in soybean cultivation.
- 4.5 Marketing channel, price spread and producer's share in consumer's rupee.
- 4.6 Constraints in production and marketing of soybean.

4.1 Socio-economic characteristics of the respondents

Five relevant socio economic characteristics were identified to throw light on the research on soybean in detail. They are put as under with sub-headings.

4.1.1 Age of the respondents

The soybean growing peasants of Belagavi district were of the average age of 43 years (Table 4.1) with a range from 28 to 59. The category wise analysis indicates that medium farmers were found least average age of 41.70 years, while in large farmers were found highest average age of 46.10 years. In case of small farmers it was around 43.18 years.

4.1.2 Educational status of the respondents

With regard to educational status of the sample farmers, the results presented in Table 4.1 indicated that on an average 71.93 per cent, 81.40 per cent and 85 per cent of small, medium and large sample farmers were observed to be literates and remaining 28.07 per cent, 18.60 and 15 per cent of as illiterates in the same order. Thus, it was apparent that the education level of the large and medium farmers was high as compared to that of small farmers.

4.1.3 Family type

The results on type of family (Table 4.1) indicate that majority of the farmer's belonged to nuclear family. And it is highest in case of large farmers (70 %). The number of nuclear families were 36, 30, and 14 for small, medium and large farmers, respectively, whereas the number of joint families were 21, 13, and 6 for small, medium and large farmers, respectively. More joint families were observed in case of small farmers (36.84 %).

4.1.4 Family composition

The study on family composition (Table 4.1) also indicates that average male population per family was fairly high (2.8) compared to female population (2.2). While overall category of farmers male constitutes higher number compared to female composition of the family.

4.1.5 Occupational pattern

The occupational pattern of sample farmers is presented in Table 4.1 which indicates that having agriculture as the main occupation, which was noticed amongst 51 respondents, i.e. 89.47 per cent in case of small farmers. In case of medium category farmers it was 40, i.e. 93.02 per cent and 17 respondents, 85 per cent in case of large farmers. While agriculture as subsidiary occupation was less than 15 per cent in all the three categories.

Table 4.1: Socio-economic characteristics of the respondents of Belagavi district

| S No. | Particulars | Small farmers | Medium farmers | Large farmers | Overall farmers |
|-------|-----------------------------|---------------|----------------|---------------|-----------------|
| | | n=57 | n=43 | n=20 | n=120 |
| 1 | Age (years) | 43.18 | 41.7 | 46.1 | 43.66 |
| 2 | Education status (No.) | | | | |
| | a. Illiterate | 16 (28.07) | 8 (18.60) | 3 (15) | 27 (22.50) |
| | b. Literate | 41 (71.93) | 35 (81.40) | 17 (85) | 93 (77.50) |
| 3 | Type of family (No.) | | | | |
| | a. Nuclear | 36 (63.16) | 30 (69.77) | 14 (70) | 80 (66.60) |
| | b. Joint | 21 (36.84) | 13 (30.23) | 6 (30) | 40 (33.40) |
| 4 | Family composition (No.) | | | | |
| | a. Male | 2.3 (54.11) | 2.67 (57.79) | 4.55 (56.52) | 2.80 (56) |
| | b. Female | 1.95 (45.89) | 1.95 (42.21) | 3.5 (43.48) | 2.20 (44) |
| 5 | Occupational pattern (No.) | | | | |
| | a. Agriculture | 51 (89.47) | 40 (93.02) | 17 (85) | 108 (90) |
| | b. Agril + other subsidiary | 6 (10.53) | 3 (6.98) | 3 (15) | 12 (10) |

Note: Figures in the parentheses indicate percentage to total

4.1.6 Land utilisation pattern of sample respondents

Land utilization pattern presented in Table 4.2 indicates the detail on size of holding allotted for soybean, and average size of leased in and leased out land by the respondents. The size of land holding for the overall category was 2.85 ha. The average size of the land holding was 1.18, 2.87, and 4.52 ha for small, medium and large farmers, respectively. The average size of the operational land holdings was 1.21, 2.94 and 4.96 ha for small, medium and large farmers, respectively, as it was included leased in land of 0.06, 0.15 and 0.44 ha for small, medium and large farmers respectively. And leased out land of 0.03, 0.076 and zero ha for small, medium and large farmers respectively. The average area occupied by the soybean crop was 0.74 ha, 1.59 ha, and 2.44 ha for small, medium and large farmers respectively.

4.1.7 Cropping pattern of sample respondents

It could be seen from Table 4.3, all the three categories of farmers were growing around six *kharif* crops, five *rabi* crops and four summer crops. The major crops grown during *kharif* were soybean, maize, chilli groundnut, cotton, horse gram. Among these crops, the area under soybean was found the highest. On an average area occupied by the soybean was 0.74 ha, 1.59 ha, and 2.44 ha, respectively by small, medium and large farmers and was 1.59 ha for overall category of farmers.

Maize occupied 0.15 ha, 0.33 ha, and 0.56 ha on small, medium and large farmers respectively. The average area under chilli was 0.08 ha, 0.21 ha, and 0.66 ha for small, medium and large farmers, respectively. The average area under groundnut was 0.03 ha, 0.10 ha, and 0.46 ha for small, medium and large farmers, respectively. Farmer grew paddy crop on 0.03 ha, 0.10 ha, and 0.6 ha, in the case of small, medium and large farmers, respectively. The average area under horse gram crop was 0.08 ha, 0.12 ha, and 0.24 ha on small, medium and large farms, respectively.

During *rabi* season, wheat, chickpea, sorghum and cabbage, brinjal were the major crops grown. The average total area under these crops was 1.01, 2.09, and 3.84 ha, in case of small, medium and large farmers, respectively. Among the *rabi* crops, cabbage was the leading crop. The average area under crop was 0.3 ha, 0.66 ha, and 1.02 ha for small, medium and large farmers, respectively. The respective area for sorghum crop was 0.22 ha, 0.38 ha, and 0.56 ha. Area occupied by wheat crop was 0.16 ha, 0.2 ha, and 0.54 ha in the case of small, medium and large category of farmers, respectively. Area occupied by chickpea crop was 0.16 ha, 0.42 ha, and 0.86 ha in the case of small, medium and large category of farmers, respectively. Area occupied by brinjal was 0.17 ha, 0.43 ha and 0.86 ha in the case of small, medium and large category of farmers, respectively.

During summer season, vegetables were the major crops grown. The average area under these crops was 0.65 ha, 0.97 ha and 1.82 ha, in case of small, medium and large farmers, respectively. Sugarcane is the crop which was grown throughout the year. The area under the crop was 0.3, 1.47 and 2.91 ha for of small, medium and large farmers, respectively.

Cropping intensity was seen high in case of large farmers i.e. 272 per cent followed by medium farmers 237 per cent and small farmers 253 per cent and worked out to be 259 per cent for the overall category of respondents.

Table 4.2: Land ownership and utilisation pattern among sample farmers

(Area in ha)

| S No. | Particulars | Small farmers | Medium farmers | Large farmers | Overall farmers |
|-------|----------------------------------|---------------|----------------|---------------|-----------------|
| | | n=57 | n=43 | n=20 | n=120 |
| 1 | Average size of land holdings | 1.18 | 2.87 | 4.52 | 2.85 |
| 2 | Average size of leased- in-land | 0.06 | 0.15 | 0.44 | 0.21 |
| 3 | Average size of- leased-out land | 0.03 | 0.076 | 0 | 0.03 |
| 4 | Total operational land holdings | 1.21 | 2.94 | 4.96 | 3.03 |
| 5 | Average area under soybean | 0.74 | 1.59 | 2.44 | 1.59 |

Table 4.3: Cropping pattern of the respondents (2015-16)

(Area in ha)

| S No. | Crops | Small farmers | Medium farmers | Large farmers | Overall farmers |
|-------|--------------------|---------------|----------------|---------------|-----------------|
| | | n=57 | n=43 | n=20 | n=120 |
| I | <i>Kharif</i> | | | | |
| 1 | Soybean | 0.74 (66.60) | 1.59 (64.89) | 2.44 (49.19) | 1.59 (60.24) |
| 2 | Maize | 0.15 (13.51) | 0.33 (13.46) | 0.56 (11.29) | 0.35 (12.75) |
| 3 | Chilli | 0.08 (7.20) | 0.21 (8.57) | 0.66 (13.33) | 0.32 (9.70) |
| 4 | Groundnut | 0.03 (2.71) | 0.1 (4.09) | 0.46 (9.27) | 0.19 (5.35) |
| 5 | Paddy | 0.03 (2.71) | 0.1 (4.09) | 0.6 (12.09) | 0.24 (6.30) |
| 6 | Horsegram | 0.08 (7.20) | 0.12 (4.89) | 0.24 (4.83) | 0.15 (5.66) |
| | Sub-total | 1.11 (100) | 2.45 (100) | 4.96 (100) | 2.84 (100) |
| II | <i>Rabi</i> | | | | |
| 1 | Wheat | 0.16 (15.84) | 0.2 (9.56) | 0.54 (14.06) | 0.3 (13.15) |
| 2 | Chickpea | 0.16 (15.84) | 0.42 (20.10) | 0.86 (22.40) | 0.48 (19.46) |
| 3 | Sorghum | 0.22 (21.79) | 0.38 (18.18) | 0.56 (14.59) | 0.39 (18.89) |
| 4 | Cabbage | 0.3 (29.70) | 0.66 (31.58) | 1.02 (26.56) | 0.66 (29.30) |
| 5 | Brinjal | 0.17 (16.83) | 0.43 (20.58) | 0.86 (22.39) | 0.48 (19.20) |
| | Sub-total | 1.01 (100) | 2.09 (100) | 3.84 (100) | 2.31 (100) |
| III | Summer | | | | |
| 1 | Brinjal | 0.13 (20) | 0.28 (28.87) | 0.56 (30.77) | 0.32 (26.55) |
| 2 | Cauliflower | 0.18 (27.70) | 0.2 (20.61) | 0.34 (18.68) | 0.24 (22.33) |
| 3 | Onion | 0.19 (29.23) | 0.21 (21.65) | 0.42 (23.07) | 0.27 (24.65) |
| 4 | Tomato | 0.15 (23.07) | 0.28 (28.87) | 0.5 (27.48) | 0.31 (26.47) |
| | Sub-total | 0.65 (100) | 0.97 (100) | 1.82 (100) | 1.14 (100) |
| | Annual crop | | | | |
| | Sugarcane | 0.3 | 1.47 | 2.91 | 1.56 |
| IV | Gross cropped area | 3.07 | 6.98 | 13.53 | 7.86 |
| V | Net cropped area | 1.21 | 2.94 | 4.96 | 3.03 |
| VI | Cropping Intensity | 253 | 237 | 272 | 259 |

Note: Figures in the parentheses indicate percentage to total

4.2 Growth in area and production

The growth rates of area, production and productivity of soybean crop in the Belagavi district as a whole for the period of fourteen years from 1998-99 to 2012-13 had been worked out and presented in Table 4.4. The results indicated that there was positive and significant growth of soybean with respect to area (3.33 % per annum), and production was positive but non-significant (1.29 % per annum) but productivity showing negative growth rate (-1.98 % per annum). The growth in area over the year is although 3.33 per cent, but the figures indicate lot of fluctuation in alternative year. The fluctuation is quite large in 2009-10. Similarly growth in production over the year also observed fluctuating, while productivity was observed high when area is less in alternative years.

4.3 Costs and returns in soybean production

4.3.1 Input use management

Results of costs and returns in soybean production are presented under the following sub heads. In any cultivation, input management assumes critical importance. In soybean grown under rain fed condition makes use of seven critical inputs which are essential for the successful cropping. Inputs utilized per hectare of soybean cultivation were presented in Table 4.5. It indicated that, the average per hectare utilization of seeds was 67.44 kg. Among the different category of farmers, it was the highest in the case of medium farmers (68.20 kg) followed by large farmers (67.25 kg) and small farmers (66.89 kg). The average per hectare utilization of human labour was 47.26 man days, and the highest labour, requirement was seen on large category farms (50.98 man days) followed by medium farms (46.65 man days) and small farms (44.16 man days). With respect to bullock labour, the highest utilization was seen on large farms (8.53 pair days) followed by medium farmer's plots (7.96 pair days) and small farmers fields (7.35 pair days) and it was 7.94 pair days for the overall category farms. The highest machine labour was utilized by large farmers (9.41 hours) followed by small farmers (8.39 hours), medium farmers (7.79 hours) and on overall category farms it was 8.53 hours. The average quantity of farm yard manure (FYM) applied per hectare in the study area was 3.86 tonnes and among different category of farms, the highest FYM application was observed in case of small farmers (4.31 tonnes) followed by large category farmers (3.65 tonnes) and medium category farmers (3.62 tonnes). The average quantity of fertilizers applied per hectare in the study area was 213 kg and it was the highest on large farmer's fields (225 kg) followed by small category farms (208 kg) and medium category farms (206 kg). The average quantity of PPC (Plant protection chemicals) application per hectare in the study area was 1.14 liters and it was the highest in the case of large farmers (1.24 liters) followed by medium category farmers (1.15 liters) and the small category farmers (1.03 liters).

4.3.2 Labour utilization and management

The operation-wise labour management in soybean cultivation under different farm size holders has been presented in Table 4.6 It was evident from the table that the per hectare human labour use was 47.26 man days, bullock labour was 7.94 pair days and machine labour was 8.53 hours. Among different operations, harvesting consumed the highest of 8.48 man days of labour followed by weeding (7.04 man days), loading and transportation of FYM (4.97 man days), sowing (4.86 man days), inter cultivation (4.18 man days), fertilizers application (4.14 man days), spreading of FYM (3.62 man days), PPC application (3.38 man days), harrowing (1.98 man days), ploughing (1.74 man days), clod crushing (1.57 man days) and gap filling (1.26 man days).

Table 4.4: Compound growth rates of area, production and productivity of soybean in Belagavi district (1998-99 to 2012-13)

| Year | Area | Production | Productivity |
|---------|-------------------|--------------------|---------------------|
| | (ha) | (t) | (kg/ha) |
| 1998-99 | 53,052 | 58,866 | 1,110 |
| 1999-00 | 54,298 | 50,087 | 922 |
| 2000-01 | 52,760 | 56,888 | 1,078 |
| 2001-02 | 42,588 | 35,846 | 842 |
| 2002-03 | 49,707 | 42,830 | 862 |
| 2003-04 | 62,203 | 27,124 | 436 |
| 2004-05 | 97,168 | 59,447 | 612 |
| 2005-06 | 69,115 | 38,279 | 554 |
| 2006-07 | 76,927 | 58,976 | 767 |
| 2007-08 | 64,422 | 55,387 | 860 |
| 2008-09 | 70,104 | 47,152 | 673 |
| 2009-10 | 97,400 | 49,318 | 506 |
| 2010-11 | 78,662 | 64,715 | 823 |
| 2011-12 | 77,257 | 78,385 | 1,015 |
| 2012-13 | 60,238 | 39,829 | 661 |
| CGR (%) | 3.33 ^S | 1.29 ^{NS} | -1.98 ^{NS} |

Note: * Indicates significant at one per cent level

S: Significant

NS: Non-significant

In soybean cultivation, machine labour was the most commonly used than bullock labour in the study area. Among different category of farmers, large farmers utilized more machine labour. Farm operations such as ploughing consumed 2.48 hour, transportation of FYM 1.79 hour, clod crushing 1.75 hour, harvesting and threshing 1.32 hours, sowing 0.63 hour, harrowing 0.54 hours in cultivation of per hectare of soybean in the overall study area. Apart from machine, the operation like ploughing, clod crushing and harrowing, loading and transportation of FYM, sowing and inter-cultivation were done through 0.26, 0.12, 1.80 and 0.51, 1.82 , 3.03 bullock pair, respectively. However, among different farm size categories not much difference observed with regard to human labour utilization but slightly difference was observed in case of bullock labour and machine labour.

4.3.3 Cost structure in soybean cultivation

The cost incurred and returns realized from soybean cultivation were calculated and presented in Table 4.7. The share of total variable cost was 77.30 per cent in the total cost. Among the different category of farms, the total variable cost incurred by small farmers was (₹ 39,935.93 / ha) as compared to medium (₹ 40,555.98 / ha) and large category farmers (₹ 43,266.08 / ha). The distribution pattern of operational cost under various inputs indicated that cost of human labour accounted for the highest share. In the case of small farmers i.e. ₹ 9,485 / ha, compared to medium (₹ 10,651.5 / ha) and large farmers (₹ 11,139 / ha). The cost of machine labour was lowest in medium farmers (₹ 6,232 / ha), compared to small farmers (₹ 6,712 / ha) and large farmers (₹ 7,528 / ha). Whereas, bullock labour cost was the highest in case of large farmers (₹ 6,824 / ha) followed by medium (₹ 6,368 / ha) and small farmers (₹ 5,880 / ha) and increased with the size of land holding. The cost of FYM was the lowest on medium farmers (₹ 4,709 / ha) compared to large farmers (₹ 4,750 / ha) and small farms (₹ 5,614 / ha). The cost of seeds was the lowest in large farmers (₹ 4,095.75 / ha) and highest in case of medium farmers (₹ 4,191.74 / ha). And small farmers was (₹ 4,116.40 / ha). It could be also observed from the table that the expenditure on pesticide was the highest (₹ 1,675 / ha) for large farmers followed by medium (₹ 1,590 / ha) and small farmers (₹ 1,503.94 / ha). The highest expenditure on fertilizers (₹ 4,065.53 / ha) was observed on large farms followed by medium (₹ 3,827.04 / ha) and small farmers (₹ 3,697.59 / ha).

The share of fixed cost in the total cost of cultivation was 22.69 per cent in the overall study area. The farm category-wise analysis indicated that fixed cost incurred by large farmers was higher (₹ 12,231.96 / ha) as compared to medium and small farmers (₹ 12,112.3 / ha and (₹ 11,979.02 / ha, respectively). Among the different items of fixed costs, rental value of land was highest which accounted for 18.74 per cent of the total cost of cultivation in the overall study area. The other items like land revenue, depreciation charges and interest on fixed capital were almost same. The farm category wise share of different items in variable cost was shown in Fig.3. For easy comparison and valid explanation. Similarly Fig.4 indicated the comparison of different components of total cost of production of soybean in the overall study area. Fig.5 indicated comparison of total costs gross returns and net returns across different categories of farms. Among the three categories of farmers, the total cost incurred by the large farmers was the highest (₹ 55,498.04 / ha) as compared to medium and small farmers (₹ 52,668.28 / ha and ₹ 51,914.95 / ha, respectively) as presented in Table 4.7.

Table 4.5: Input use management in soybean cultivation

(Per ha)

| Sl. No. | Particulars | Units/ha | Small farmers | Medium farmers | Large farmers | Over all farmers |
|---------|----------------|-----------|---------------|----------------|---------------|------------------|
| | | | (n=57) | (n=43) | (n=20) | (n=120) |
| 1 | Seeds | kg | 66.89 | 68.20 | 67.25 | 67.44 |
| 2 | Human labour | Man days | 44.16 | 46.65 | 50.98 | 47.26 |
| 3 | Bullock labour | Pair days | 7.35 | 7.96 | 8.53 | 7.94 |
| 4 | Machine labour | Hours | 8.39 | 7.79 | 9.41 | 8.53 |
| 5 | FYM | Tonnes | 4.31 | 3.62 | 3.65 | 3.86 |
| 6 | Fertilizers | kg | 208 | 206 | 225 | 213 |
| 7 | PPC | litre | 1.03 | 1.15 | 1.24 | 1.14 |

Table 4.6: Operation wise labour utilization pattern in soybean cultivation

(Per ha)

| S N. | Particulars | Small farmers | | | Medium farmers | | | Large farmers | | | Overall farmers | | |
|------|--------------------------------|---------------|------|------|----------------|------|------|---------------|------|------|-----------------|------|------|
| | | (n=57) | | | (n=43) | | | (n=20) | | | (n=120) | | |
| | | HL | BL | ML | HL | BL | ML | HL | BL | ML | HL | BL | ML |
| 1 | Ploughing | 1.80 | 0.57 | 2.45 | 1.81 | 0.23 | 2.50 | 1.63 | 0 | 2.51 | 1.74 | 0.26 | 2.48 |
| 2 | Clod crushing | 1.45 | 0.36 | 1.62 | 1.52 | 00 | 1.51 | 1.76 | 0 | 2.13 | 1.57 | 0.12 | 1.75 |
| 3 | Harrowing | 1.8 | 1.80 | 0.53 | 2.03 | 1.98 | 0.23 | 2.13 | 1.63 | 0.88 | 1.98 | 1.80 | 0.54 |
| 4 | Loading, transportation of FYM | 4.61 | 0.70 | 1.80 | 4.94 | 0.46 | 1.81 | 5.38 | 0.38 | 1.76 | 4.97 | 0.51 | 1.79 |
| 5 | Spreading of FYM | 3.78 | 00 | 00 | 3.34 | 00 | 00 | 3.76 | 00 | 00 | 3.62 | 00 | 00 |
| 6 | Sowing | 4.86 | 1.06 | 1.28 | 4.71 | 2.27 | 0.23 | 5.01 | 2.13 | 0.38 | 4.86 | 1.82 | 0.63 |
| 7 | Fertilizer application | 3.41 | 00 | 00 | 4.25 | 00 | 00 | 4.76 | 00 | 00 | 4.14 | 00 | 00 |
| 8 | Gap filling | 0.71 | 00 | 00 | 1.56 | 00 | 00 | 1.51 | 00 | 00 | 1.26 | 00 | 00 |
| 9 | Weeding | 6.44 | 00 | 00 | 6.81 | 00 | 00 | 7.89 | 00 | 00 | 7.04 | 00 | 00 |
| 10 | Inter cultivation | 4.08 | 2.68 | 00 | 3.95 | 2.79 | 00 | 4.51 | 3.63 | 00 | 4.18 | 3.03 | 00 |
| 11 | PPC application | 3.03 | 00 | 00 | 3.48 | 00 | 00 | 3.63 | 00 | 00 | 3.38 | 00 | 00 |
| 12 | Harvesting and treshing | 8.19 | 0.18 | 0.71 | 8.25 | 0.23 | 1.51 | 9.01 | 0.76 | 1.75 | 8.48 | 0.39 | 1.32 |
| | Total | 44.16 | 7.35 | 8.39 | 46.65 | 7.96 | 7.79 | 50.98 | 8.53 | 9.41 | 47.26 | 7.94 | 8.53 |

Note: HL- Human Labour BL- Bullock Labour ML- Machine Labour

4.3.4 Returns structure in soybean production

The farm category wise analysis of gross returns as presented in table 4.8 indicated that the gross returns obtained by large farmers were higher (₹ 92,256.87 / ha) as compared to medium (₹ 86,812.95 / ha) and small farmers (₹ 83,875.29 / ha). With respect to net returns obtained by the large farmers were higher (₹ 36,758.83 / ha) as compared to medium (₹ 34,144.67 / ha) and small farmers (₹ 31,960.34 / ha). The cultivation of soybean in the study area found to be profitable as also supported by a high magnitude of B: C Ratio of 1.64 for overall study area. The average quantity of yield obtained on the overall category farmers in the study area was 24.61 q / ha. The highest yield was obtained by large farmers (25.75 q) followed by medium farmers (24.36 q) and small farmers (23.73 q).

4.4 Resource use efficiency in soybean cultivation

It has been studied under the following sub heads

4.4.1 Cobb-Douglas type production function analysis

The Cobb- Douglas production function coefficients were estimated to analyse relationship between resource and productivity of soybean using the data from the respondents. The gross income realized from soybean output was taken as dependent variable while expenditure on seed, FYM, human labour, bullock labour, machine labour, fertilizer, and PPC were taken as independent variables. The estimates of the production function coefficients are presented in the Table 4.9. The inputs included in model explained 80 per cent (small farmers), 88 per cent (medium farmers) and 91 per cent (large farmers) variation in soybean output as revealed by the coefficient of multiple determination (R^2). The summation of regression coefficients indicated increasing returns to scale *i.e.* for each incremental use of all inputs simultaneously farmers would get more than one unit of output for medium (1.10) and large farmers (1.05), where as decreasing returns to scale were observed for small farmers (0.98). The coefficient of multiple determination (R^2) for soybean production was 0.82. This indicated that the variables included in the function explained 82 per cent of the variation in the production of soybean for the overall study area.

The estimated coefficient of Human labour (-0.17) was negative and significant at one per cent, and fertilizers (0.62) significant at one per cent, while seed (0.136) coefficient was significant at five per cent. PPC (-0.03) coefficients was negative and significant at five per cent, while machine labour (-0.007) coefficient was negative and non significant. And bullock labour (0.40) was non significant. FYM (0.034) was non significant for small farmers. In medium farmers the estimated coefficient of seeds (0.653), FYM (0.128) bullock labour (0.017) and machine labour (0.136) were positive significant at one per cent. While fertilizers (-0.182) co-efficient was negative and significant at five per cent. However, PPC (-0.007) and human labour (-0.002) are negative and non significant.

In case of large farmers FYM (0.815) was positive and significant at one per cent, human labour (-0.49) was negative and significant at one per cent. While seeds (0.87) was positive and significant at five per cent, fertilizers (-0.031) was negative and significant at five per cent. Bullock labour (-0.03) and (-0.108) were negative but non significant, ppc (0.024) was positive and significant.

Table 4.7: Cost of cultivation in soybean

(₹ / ha)

| Sl. No | Particulars | Small farmers | Medium farmers | Large farmers | Overall farmers |
|----------------------------------|-----------------------------------|----------------------|---------------------|----------------------|----------------------|
| | | (n=57) | (n=43) | (n=20) | (n=120) |
| Variable cost | | | | | |
| 1 | Seeds | 4116.40 (7.92) | 4191.74 (7.95) | 4095.75 (7.45) | 4134.63 (7.70) |
| 2 | Human labour | 9485 (18.27) | 10,651.5 (20.22) | 11,139 (20.07) | 10,425.16 (19.53) |
| 3 | Bullock labour | 5880 (11.32) | 6368 (12.09) | 6824 (12.29) | 6357.33 (11.91) |
| 4 | Machine labour | 6712 (12.92) | 6232 (11.83) | 7528 (13.56) | 6824 (12.70) |
| 5 | Organic Manure | 5614 (10.81) | 4709 (8.94) | 4750 (8.55) | 5024.33 (9.41) |
| 6 | Fertilizers | 3697.59 (7.12) | 3827.04 (7.26) | 4065.53 (7.32) | 3863.38 (7.24) |
| 7 | PPC | 1503.94 (2.89) | 1590.7 (3.02) | 1675 (3.01) | 1589.88 (2.97) |
| 8 | Interest on working capital @ 8 % | 2927 (5.63) | 2986 (5.66) | 3189 (5.74) | 3034 (5.68) |
| | Subtotal (I) | 39,935.93 (76.92) | 40,555.98 (77) | 43,266.08 (77.95) | 41,252.71 (77.30) |
| Fixed Cost | | | | | |
| 1 | Rental value of land | 10,000 (19.26) | 10,000 (18.98) | 10,000 (18.01) | 10,000 (18.74) |
| 2 | Land revenue | 125 (0.24) | 125 (0.23) | 125 (0.22) | 125 (0.23) |
| 3 | Depreciation | 570.56 (1.09) | 689.60 (1.30) | 796.40 (1.43) | 685.52 (1.28) |
| 4 | Interest on Fixed capital @ 12 % | 1283.46 (2.47) | 1297.7 (2.46) | 1310.56 (2.36) | 1297.26 (2.43) |
| | Subtotal (II) | 11,979.02 (23.08) | 12,112.3 (23) | 12,231.96 (22.05) | 12,107.78 (22.7) |
| Total cost of cultivation (I+II) | | 51,914.95 (100) | 52,668.28 (100) | 55,498.04 (100) | 53,360.49 (100) |

Note: Figures in the parentheses indicate percentage to total

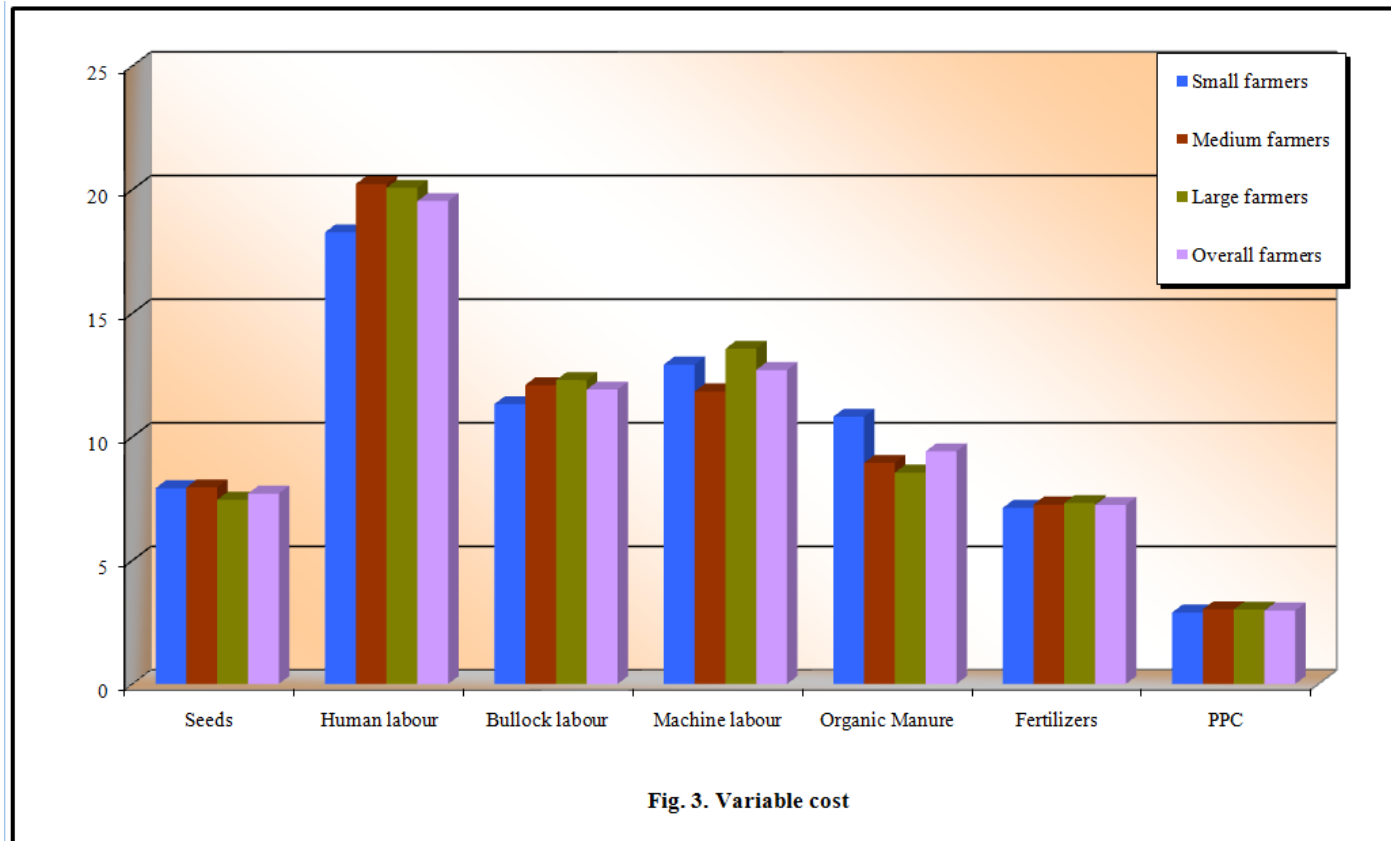


Fig. 3. Variable cost

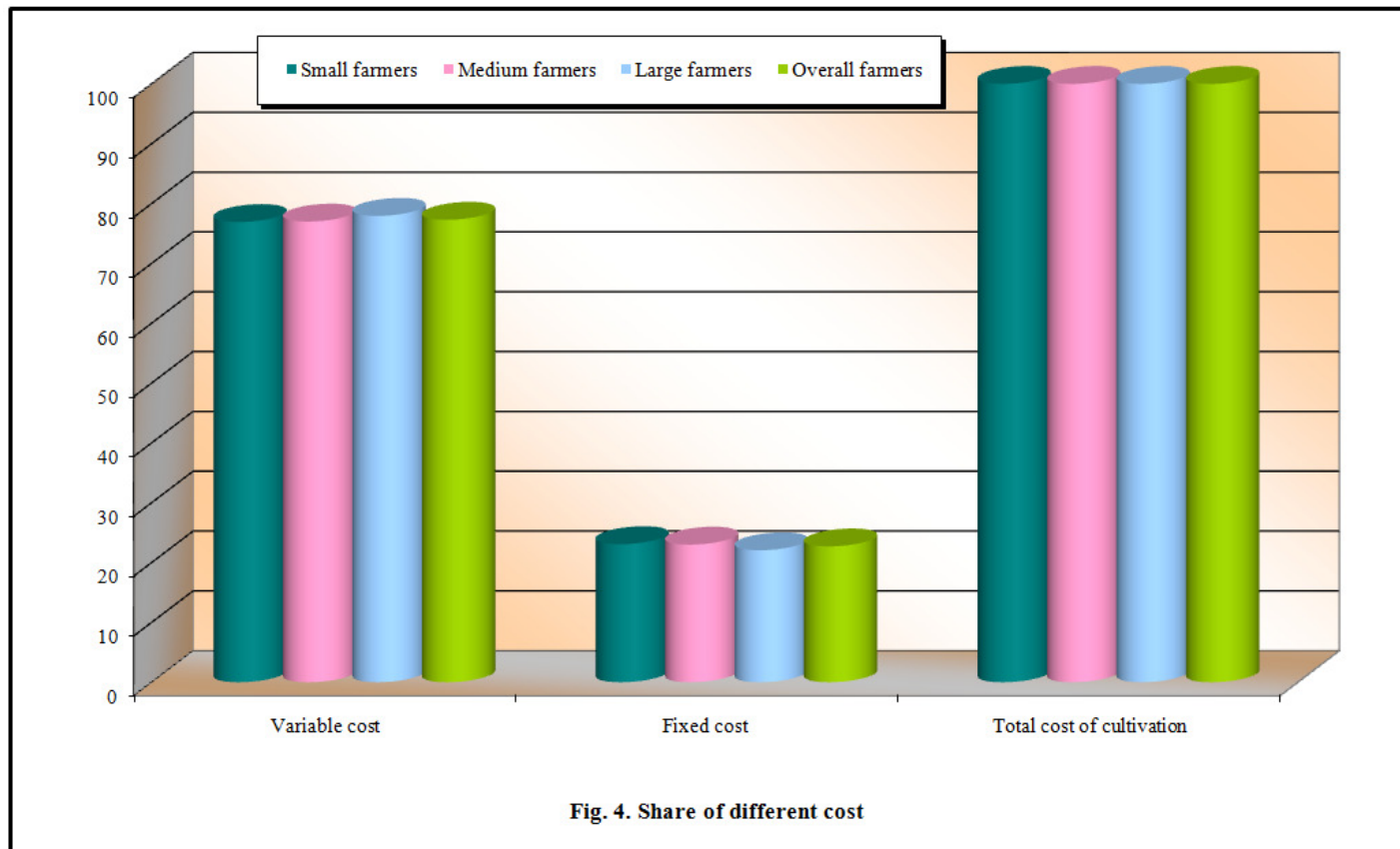


Fig. 4. Share of different cost

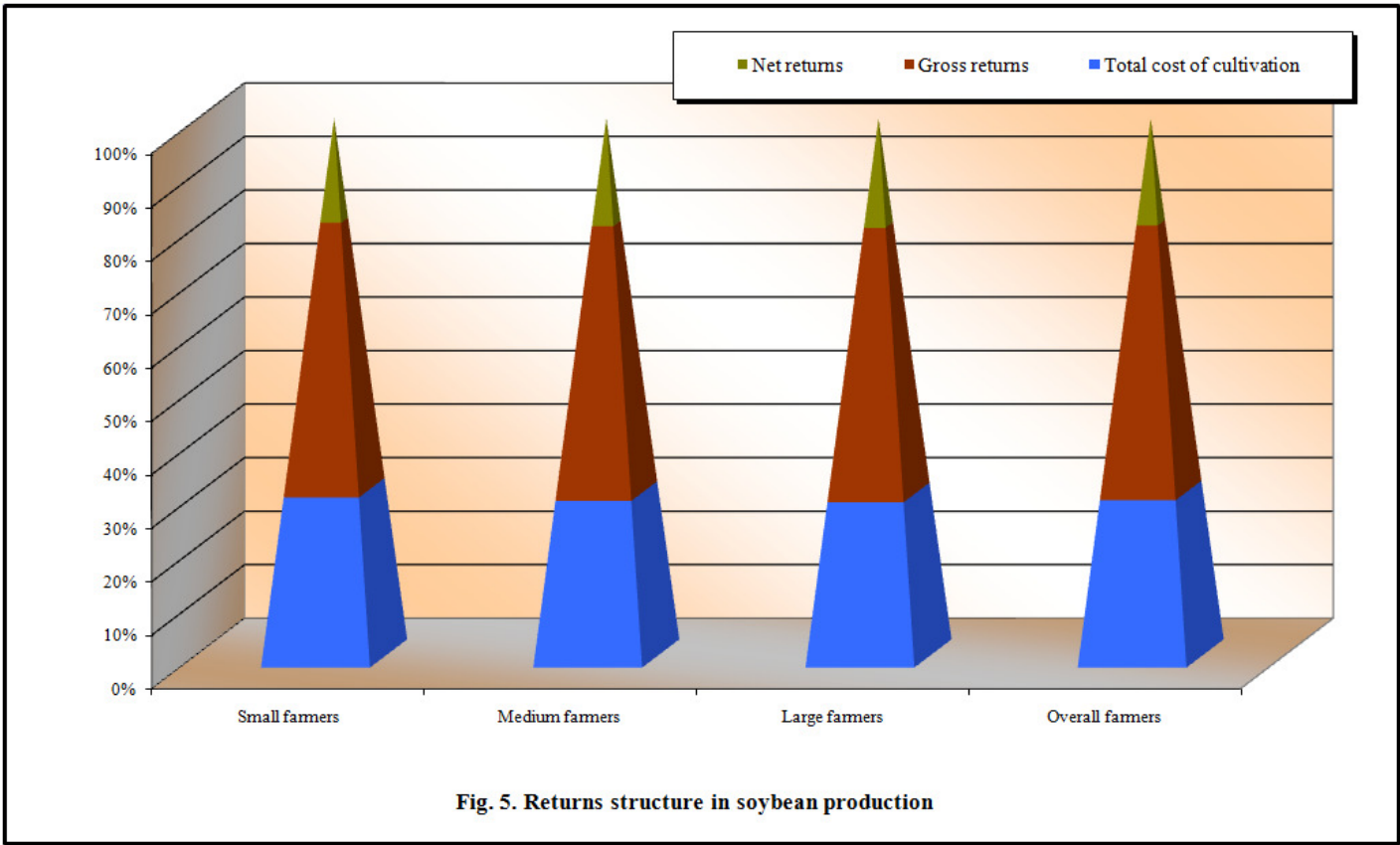


Fig. 5. Returns structure in soybean production

Table 4.8: Returns structure in soybean production

(Per ha)

| Sl. No. | Particulars | Small farmers | Medium farmers | Large farmers | Overall farmers |
|---------|--------------------------------|---------------|----------------|---------------|-----------------|
| | | (n=57) | (n=43) | (n=20) | (n=120) |
| I | Yield | | | | |
| | a. Main product- grains (q) | 23.73 | 24.36 | 25.75 | 24.61 |
| | b. By products - (q) | 17.32 | 18.08 | 19.13 | 18.17 |
| II | Sale price | | | | |
| | a. Grains (₹/q) | 3,461.58 | 3,489.53 | 3,508.50 | 3,486.53 |
| | b. By products- (₹/q) | 100 | 100 | 100 | 100 |
| III | Gross return | | | | |
| | a. Grains (₹/ha) | 82,143.29 | 85,004.95 | 90,343.87 | 85,803.50 |
| | b. By products- (₹/ha) | 1,732.00 | 1,808.00 | 1,913.00 | 1,817.00 |
| | (Main products + By products) | 83,875.29 | 86,812.95 | 92,256.87 | 87,620.5 |
| IV | Total cost of cultivation (₹) | 51,914.95 | 52,668.28 | 55,498.04 | 53,360.49 |
| V | Net return (₹/ha) | 31,960.34 | 34,144.67 | 36,758.83 | 34,260.01 |
| VI | B:C ratio | 1.61 | 1.64 | 1.66 | 1.64 |

Table 4.9: Resource use efficiency of inputs in soybean

(Per ha)

| Sl. No. | Explanatory variables | Parameters | Small farmers | Medium farmers | Large farmers | Overall farmers |
|---------|---|----------------|--------------------|--------------------|---------------------|--------------------|
| | | | (n=57) | (n=43) | (n=20) | (n=120) |
| 1. | Intercept | A | 2.67 (0.37) | 0.95 (0.314) | 1.37 (1.91) | 0.27 (2.48) |
| 2. | Seeds (₹) | b ₁ | 0.136** (0.066) | 0.653* (0.075) | 0.87** (0.35) | 0.53** (0.45) |
| 3. | Farmyard manure (₹) | b ₂ | 0.034 (0.023) | 0.128* (0.031) | 0.815* (0.102) | 0.47* (0.132) |
| 4. | Human labour (₹) | b ₃ | -0.17* (0.064) | -0.002 (0.016) | -0.497* (0.073) | -0.415* (0.094) |
| 5. | Bullock labour (₹) | b ₄ | 0.40 (0.017) | 0.017* (0.004) | -0.03 (0.059) | 0.55 (0.77) |
| 6. | Machine labour (₹) | b ₅ | -0.007 (0.027) | 0.136* (0.016) | -0.108 (0.082) | -0.009 (0.106) |
| 7. | Fertilizers (₹) | b ₆ | 0.62* (0.06) | 0.182** (0.076) | -0.031** (0.014) | -0.012 (0.018) |
| 8. | PPC (₹) | b ₇ | -0.03** (0.014) | -0.007 (0.005) | 0.024 (0.102) | 0.027 (0.133) |
| 9. | Coefficient of multiple determination (R ²) | | 0.80 | 0.88 | 0.91 | 0.82 |
| 10. | Returns to scale ($\sum b_i$) | | 0.98 | 1.10 | 1.05 | 1.14 |

Note: Figures in the parentheses indicates their respective standard errors

*- Significant at one per cent level

** - Significant at five per cent level

In case of overall study FYM (0.47) was positive and significant at one per cent. While human labour (-0.415) was negative and significant at one per cent. Seeds (0.53) was positive and significant at five per cent. Bullock labour (0.55) and ppc (0.027) were positive and non significant. Machine labour (-0.009) and fertilizers (-0.012) were negative and non significant. The sum of elasticities (Σb) is 1.14, which indicated increasing returns to scale more than unity. A one per cent increase in all the inputs used in the production simultaneously would increase output by 1.14 per cent.

4.4.2. MVP to MFC ratios of resources in soybean production

The Cobb-Douglas type production function coefficients which expand the output classification of production and geometric levels of inputs were used to estimate the marginal value product. The knowledge of the marginal value products of resources facilitated comparison of marginal value product with marginal factor cost of the resources to arrive at optimal use of resources. The results on MVP to MFC ratios were given in Table 4.10. In the case of small farmers, the MVP to MFC ratio for seed (2.77), Bullock labour (6.26), Fertilizers (14.62) were more than one indicating that still there is scope for higher utilization of these inputs and which in turn would increase the gross income and hence maximize their profit in soybean production. However, higher ratio for seeds indicated that additional usage of seeds would bring more returns. In the case of medium farmers, the MVP to MFC ratio for seeds (13.47), FYM (2.45), machine labour (2.02) and fertilizer (4.13) were more than one indicating that still there was scope for higher utilization of these inputs and which in turn would increase the gross income. Similar analysis for large farmers indicated that seed (18.78), FYM (15.22), and PPC (1.28) were more than one indicating scope for higher utilization of these inputs. And for overall category, seeds (20.60), FYM (12.98), and PPC (1.52) were more than one indicating that still there was scope for higher utilization of these inputs and which in turn would increase the gross income.

4.5. Marketing margins and price spread in different channels in the marketing of soybean.

A systematic analysis of costs and margins of various intermediaries involved in marketing of soybean would help to know the various services rendered by these intermediaries and their economic performance in the marketing of soybean. The price spread was one of the measures of market efficiency, as it indicated the increase in the price of a commodity and also changed hands from one intermediary to another in the marketing process. The price spread included marketing costs incurred and margins retained by various market functionaries in addition to the costs incurred on marketing of the produce by producer. The marketing costs and margins of different market functionaries were worked out as percentage to consumer's price for the effective comparison further the price received by producer and paid by the consumer provide the extent of spread in price. The results on marketing costs and margins of intermediaries involved in the marketing of soybean in Belagavi market in Channel-I is presented in the Table 4.11. The marketing channel-I adopted in the marketing of soybean indicated distribution of produce from farmers to village merchants to wholesalers to processor (consumers).

Table 4.10: MVP to MFC ratios of resources in soybean production

| Sl. No | Explanatory variable | Parameters | Small farmers | Medium farmers | Large farmers | Overall farmers |
|--------|----------------------|------------|---------------|----------------|---------------|-----------------|
| | | | (n=57) | (n=43) | (n=20) | (n=120) |
| 1 | Seeds | b_1 | 2.77 | 13.47 | 18.78 | 20.60 |
| 2 | Farmyard manure | b_2 | 0.53 | 2.45 | 15.22 | 12.98 |
| 3 | Human labour | b_3 | -1.51 | -0.016 | -3.98 | -3.49 |
| 4 | Bullock labour | b_4 | 6.26 | 0.21 | -0.42 | 0.77 |
| 5 | Machine labour | b_5 | -0.091 | 2.02 | -1.31 | -0.12 |
| 6 | Fertilizers | b_6 | 14.62 | 4.13 | -0.67 | -0.27 |
| 7 | PPC | B_7 | -1.71 | -0.41 | 1.28 | 1.52 |

Note: MVP – Marginal Value Product, MFC – Marginal Factor Cost

The marketing costs and margins in channel-I adopted in the distribution of soybean showed the producer's price of ₹ 3,486 / q and the ultimate price paid by the consumer (processor) was ₹ 3,949 / q. It was found that farmer as a producer played a limited role as marketer to the extent of preparing the produce for the market and transporting it to the nearest market and these incurred a cost of ₹ 40.85 / q of soybean hence, by allowing the marketing cost incurred by producer actually received a net price of ₹ 3.445.15 / q of soybean which accounted for 8.82 per cent of the price spread. The share in price spread by village merchant comprising the cost incurred ₹ 71.97 / q (15.5 %) and profit margin of ₹ 163.63 (35.34 %). Similarly, the cost incurred by wholesaler was ₹ 88.7 / q (19.1 %) and profit margin of ₹ 138.71 (29.95 %) respectively. The producer's share was 87.24 per cent in channel I. It was observed that village merchant in soybean added more to the price spread when compared to wholesaler in the marketing of soybean in channel-I.

Channel II: This was the second important channel found for marketing of soybean. Farmers supplied their produce to trader or commission agent. Trader or commission agent purchased their produce from farmers where the price was found to be less (₹ 3,462.6 / q) than in channel- I. The producer's share was worked out to be 87.78 per cent in channel- II, here all the intermediaries got more or less same margin compared to channel- I. The cost incurred by farmers was ₹ 70.2 / q (17.4 %) and producer received a net price of ₹ 3392.4 / q. The margin retained by trader or commission agent, Wholesaler was recorded as ₹ 100.81 (25.07 %) and ₹ 121.29 (30.17 %).

Channel-III was adopted in the marketing of soybean indicated distribution of produce from farmers to village merchants to processor (consumers). The marketing costs and margins in Channel-III adopted in the sale of soybean showed the producers price of ₹ 3501.9 and the ultimate price paid by the consumer was ₹ 3748/qtl. It was found that farmer as a producer played a limited role as marketer to the extent of preparing the produce for the market and transporting it to the nearest market and these incurred a cost of ₹ 39.17 / q of soybean hence, by allowing the marketing cost incurred by producer actually received a net price of ₹ 3462.73/q of soybean, which accounted 15.91 per cent of the price spread. The share in price spread by village merchant comprising the cost incurred ₹ 75.91/q and profit margin (69.15 %).i.e. ₹ 170.19. The receiving price of processor was ₹ 3748 /q. The overall price spread was ₹ 246.1/q and producer's share in consumer's rupee was ₹ 92.38 per cent.

By comparing the channel-I, channel- II and channel- III with respect to marketing of soybean, channel-III have more producer's share in consumer's rupee (92.38 %) than channel-I (87.24 %), and channel-II (87.78 %) and price spread was highest in channel-I than channel-II, channel III. It shows channel-III market is more efficient than channel-I market, channel-II market.

4.6 Problems in production and marketing of soybean.

Opinion survey was conducted to know the constraints in the production, and marketing of soybean in the study area and was analysed using Garrett's ranking technique. Table 4.12 depicts the result of Garrett's ranking analysis on the problems associated with production, and marketing of soybean.

Table 4.11: Marketing costs and margins of soybean in different marketing channels

₹/qtl

| Sl. No | Particulars | Channel I | Channel II | Channel III |
|--------|---|---------------|----------------|----------------|
| 1 | Producer price | 3486 | 3462.60 | 3501.90 |
| 2 | Marketing cost incurred by producer | 40.85 (8.82) | 70.2 (17.4) | 39.17 (15.91) |
| 3 | Producers net price | 3445.15 | 3392.40 | 3462.73 |
| 4 | Purchase price of village merchant (VM) | 3486 | --- | 3501.9 |
| 5 | Profit margin of village merchant | 163.63 (35.3) | --- | 170.19 (69.15) |
| 6 | Cost incurred by village merchant | 71.97 (15.50) | --- | 75.91 (30.84) |
| 7 | Sale price of village merchant | 3721.60 | --- | 3748 |
| 8 | Purchase price of Trader/CA | --- | 3462.60 | --- |
| 9 | Profit margin by Trader/CA | --- | 100.81 (25.07) | --- |
| 10 | Cost incurred by Trader/CA | --- | 81.79 (20.34) | --- |
| 11 | Sale price of Trader/CA | --- | 3645.20 | --- |
| 12 | Purchase price of Wholesaler | 3721.60 | 3645.20 | --- |
| 13 | Profit margin by Wholesaler | 138.7 (29.95) | 121.29 (30.17) | --- |
| 14 | Cost incurred by Wholesaler | 88.7 (19.1) | 98.11 (24.40) | --- |
| 15 | Sale price of Wholesaler | 3949 | 3864.60 | --- |
| 16 | Purchase price of processor | 3949 | 3864.60 | 3748 |
| 17 | Producer's share in consumer's rupee | 87.24 | 87.78 | 92.38 |
| 18 | Price spread | 463 | 402 | 246.10 |

VM: village merchant
CA: commission agent

Table 4.12: Production and marketing constraints in soybean

| S No | Production constraints | Small farmers | | Medium farmers | | Large farmers | |
|-----------------------|--|-------------------|------|-------------------|------|-------------------|------|
| | | Mean garret score | Rank | Mean garret score | Rank | Mean garret score | Rank |
| 1 | Lack of credit facility | 51.09 | IV | 51.91 | IV | 65.05 | II |
| 2 | Non-availability of inputs | 55.37 | III | 55.40 | III | 57.20 | IV |
| 3 | High cost of labour | 65.33 | II | 65.81 | II | 57.15 | III |
| 4 | Non-availability of labour | 69.84 | I | 72.07 | I | 71.15 | I |
| 5 | Non-availability of technical guidance | 43.65 | V | 47.00 | V | 40.45 | V |
| 6 | Incidence of pest and diseases | 42.30 | VI | 32.02 | VI | 34.85 | VI |
| 7 | Lack of irrigation facility | 25.42 | VII | 28.79 | VII | 28.15 | VII |
| Marketing constraints | | | | | | | |
| 1 | Lack of transportation | 54.04 | III | 46.28 | IV | 53.85 | II |
| 2 | High cost of transportation | 55.58 | II | 48.23 | III | 51.50 | III |
| 3 | Fluctuation of market prices | 60.28 | I | 64.07 | I | 68.75 | I |
| 4 | Absence of regulated markets | 38.79 | V | 50.23 | II | 46.90 | IV |
| 5 | Distant market | 40.32 | IV | 39.72 | V | 28.00 | V |

Production problems

There are seven problems identified in soybean production which are severe in the study area such as lack of credit facility at right time, non-availability of inputs, lack of irrigation facility, incidence of pest and diseases, high cost of labour, non-availability of labour and non-availability of technical guidance were ranked based on the garrett's score computed.

From the study it was observed that majority of small farmers opined, non availability of labour was the major problem has expressed by most of the farmers which was ranked I with a mean score of 69.84, followed by high cost of labour, which was ranked II with a mean score of 65.33. The other problems were Non-availability of inputs, which was ranked III with a mean score of 55.37, Lack of credit facility at right time which was ranked IV with a mean score of 51.09, non-availability of technical guidance which was ranked V with a mean score 43.65 and incidence of pest and diseases which was ranked VI with a mean score of 42.3 and lack of irrigation facility which was ranked last with a mean score of 25.42.

In case of medium farmers, non availability of labour was the major problem as expressed by the most of the farmers which was ranked I with a mean score of 72.07, followed by high cost of labour, which was ranked II with a mean score of 65.81. The other problems were non-availability of inputs, which was ranked III with a mean score of 55.4, lack of credit facility at right time which was ranked IV with a mean score of 51.91, non-availability of technical guidance which was ranked V with a mean score 47.00 and incidence of pest and diseases which was ranked VI with a mean score of 32.02 and lack of irrigation facility which was ranked last with a mean score of 28.79.

In case of large farmers, Non availability of labour was the major problem has expressed by most of the farmers which was ranked I with a mean score of 71.15, followed by, lack of credit facility at right time which was ranked II with a mean score of 65.05. The other problems were high cost of labour, which was ranked III with a mean score of 57.15, non-availability of inputs, which was ranked IV with a mean score of 57.20, non-availability of technical guidance which was ranked V with a mean score 40.45 and Incidence of pest and diseases which was ranked VI with a mean score of 34.85 and lack of irrigation facility which was ranked last with a mean score of 28.15.

Marketing problems

There were five problems identified in soybean marketing which were severe in the study area such as fluctuation in price, high cost of transportation, lack of transportation facility, absence of regulated market and distant market were ranked based on the garrett's score computed.

Almost all the small farmers opined that high fluctuation in price which was ranked I with a mean score of 60.28, high cost of transportation which was ranked II with a mean score of 55.58, lack of transport facility which was ranked III with a mean score of 54.04, distant market which was ranked IV with a mean score of 40.32, absence of regulated market which was ranked last with a mean score of 38.79.

All the medium farmers opined that high fluctuation in price which was ranked I with a mean score of 64.07, absence of regulated markets which was ranked II with a mean score of 50.23, high cost of transportation which was ranked III with a mean score of 48.23, lack of transport facility which was ranked IV with a mean score of 46.28, distant market which was ranked last with a mean score of 39.72.

all the large farmers opined that high fluctuation in price which was ranked I with a mean score of 68.75, lack of transportation which was ranked II with a mean score of 53.85, high cost of transportation which was ranked III with a mean score of 51.50, absence of regulated markets which was ranked IV with a mean score of 46.90, distant market which was ranked last with a mean score of 28.

5. DISCUSSION

The results presented in the previous chapter were discussed in detail in this chapter. The discussion concentrated in throwing light on the possible cause for the results obtained and were presented under the following sub headings:

- 5.1 Socio economic characteristics of respondents
- 5.2. Compound growth rates of area, production and productivity
- 5.3 Costs and returns in soybean production
- 5.4. Resource use efficiency in soybean cultivation
- 5.5 Marketing channel, price spread and producer's share in consumer's rupee
- 5.6 Constraints in production and marketing of soybean.

5.1 Socio- economic characteristics of the respondents

5.1.1 Age of the respondents

The results presented in the previous chapter that encompasses general information about the soybean growers. The average age of the respondents was 43.18, 41.70 and 46.10 years for small, medium and large farmers respectively, which revealed that the most of the farmers were of high age group above four decades. Hence, old age farmers had more experience in using and adopting new technology in the production of Soybean and thus aiming for higher profit. Almost all the three classifications were of the same age group. Similar observations expressed by Sameer (2013)

5.1.2 Educational status of the respondents

It was noticed that most of the farmers were educated in the study area. Literacy level of sample respondents was 79.50 per cent and the literacy level of sample respondents ranged from primary to degree. It was noted fact that higher the education level more would be the knowledge and better would be the understanding capacity of new technologies. Here higher illiteracy was observed with small farmers which revealed awareness about the importance of medium and large farmers.

5.1.3 Family type

The most of the families (66.60 per cent) were nuclear families, this might be due to their awareness regarding the increased cost of living because of large numbers in family and differences in taste and preferences and difficulties in maintenance of joint family. The predominance of nuclear family was due to the realization of advantages of nuclear family in terms of running family, less responsibilities, privacy and more freedom of action in taking family decisions.

5.1.4 Family composition

The average male members were found higher (2.80) compared to female member (2.20) which indicates male constitutes higher number compared to female composition of the family.

5.1.5 Occupational pattern

All the respondents were involved in agriculture. About 90 per cent of the farmers were doing agriculture as a primary occupation. While remaining 10 per cent doing agriculture as a secondary occupation. Which showed the farmers mainly depend on agriculture for their income and socio economic development, remaining farmers were involved in other jobs and works outside field because of their small land holdings.

5.1.6 Land utilization pattern of sample respondents

The average size of the land holdings in the study area was 1.18 ha, 2.87 ha, and 4.52 ha for small, medium and large farmers respectively and the respective leased-in lands held by them was included 0.06 ha, 0.15 ha, and 0.44 ha. And respective leased-out lands held by them was included 0.03 ha, 0.076 ha, and zero ha. Soybean was the most common *kharif* crop in the study area as average area allocated for the soybean was 0.74 ha, 1.59 ha, and 2.44 ha for small, medium and large farmers respectively, which can be attributed to the utilization of land for optimality or sustainability of cropping.

5.1.7 Cropping pattern of sample respondents

The overall cropping pattern (Table 4.3) adopted by sample farmers in the study area revealed prominence of *kharif* crops. Interestingly in *kharif* season major area was allocated for soybean i.e. 60.24 per cent. Large number of crops like cereals, pulses, oil seeds and vegetables, commercial crops were grown in the study area to mitigate various types of risks and uncertainties. Similar observations were found with Sangamesh. (2015)

5.2. Growth in area and production

Growth rates of area and production of soybean in the Belagavi district, presented in Table 4.4, revealed positive and significant growth in area (3.33 %), and production was positive but non-significant (1.29 %), productivity was negative and non significant (-1.98 %). The annual growth rates of soybean area was positive and significant (3.33 %). The rapid expansion of area under this crop was mainly due to its important features like short duration, adoption to a wide range of soils and climatic conditions. Productivity growth was less and showing negative because mono cropping and incidence of pest. Similar reports remarked by Agarwal *et al* (2012).

5.3 Costs and returns in soybean production

5.3.1 Input use management

Inputs used in soybean cultivation in the study area revealed that the average per hectare utilization of human labour was the highest in case of large category farmers (50.98 man days) followed by medium farmers (46.65 man days) and small farmers (44.16 man days) because most of the operations such as harvesting, weeding were human labour intensive. Most farmers used more machine labour than bullock labour, farmers used the machine labour (tractor) for ploughing, sowing and other operations. Hence, the use of machine labour was more on these farms than bullock labour. This might be attributable to accomplishment of quick work, time constraint to cover area and affordability. Farmers in the study area used recommended quantity of farmyard manures (FYM) and among the various category of farmers, FYM applied was the highest in the case of small farmers (4.31 t / ha) followed by large category farmers (3.65 t / ha) and medium farmers (3.62 t / ha). Small farmers though used more FYM compared to others still the yield was less compared to others. Results presented in previous chapter revealed that there was high amount of application of chemical fertilizers in anticipation of good yield. The large farmers used higher amount of fertilizers i.e. 225 kg / ha compared to medium (206 kg / ha) and small (208 kg / ha) farmers. PPC (Plant Protection Chemicals) were used to minimize control the pests and PPC chemicals usage was high in large farms compared to small and medium farms. Similar observations were found with the study conducted by Sangamesh. 2015.

5.3.2 Labour utilization and management

The results presented in Table 4.6 revealed that around 47 human labour, eight pair of bullocks and nine hour of machine labour per hectare. Among various operations of soybean cultivation, harvesting operations consumed highest man days of labour because farmers usually go for hand picking instead machine harvesting. In soybean cultivation machine labour was most commonly used than bullock labour for the operations like ploughing, harrowing etc. Apart from machine, the operations like harrowing, loadings and transportation of FYM, were done through bullock pair. However among different farm size categories not much difference observed with regard to human labour utilization but slightly difference observed in case of bullock labour and machine labour usage.

5.3.3 Cost and Returns from Soybean cultivation

The results presented in Table 4.7 revealed that among the three categories of farmers the total cost incurred by the large farmers was found higher (₹ 55,498.04 / ha) compared to medium farmers (₹ 52,668.28 / ha) small farmers (₹ 51,914.95 / ha) respectively. This might be attributed to the fact that large farmers used more human and bullock labour and applied more fertilizers than their counterparts. The cost of human labour, fertilizers, bullock labour and machine labour were the main items of cost with major share in the variable costs (77.30 %), because most of the operations like harvesting, spraying, weeding were human labour intensive operations and the other operations like harrowing and sowing and inter-cultivation were machine labour intensive. The distribution pattern of operational cost under various inputs revealed that cost of human labour was the highest in large farms i.e. ₹ 11,139 / ha, compared to medium (₹ 10,651.5 / ha) and small farmers (₹ 9,485 / ha). Whereas average bullock labour cost was the highest in case of large farmers (₹ 6,824 / ha) followed by medium (₹ 6,368 / ha) and Small (₹ 5,880 / ha). Machine labour use cost was highest in large farmers (₹ 7,528 / ha) for ploughing, sowing and transportation and was the lowest in the case of medium farmers (₹ 6,232 / ha). The cost of seeds was the lowest on large farms (₹ 4,095.75 / ha) and the highest on medium farms (₹ 4,191.74 / ha). Due to the more availability of FYM in the study area, as well as soybean would normally respond well with FYM, hence the cost of FYM used was more and ranged from ₹ 4,709 (medium farmers) to ₹ 5,614 (small farmers). Whereas, the expenditure on fertilizers was highest (₹ 4,065.53 / ha) for large farmers as compared to medium (₹ 3,827.04 / ha) and small farmers (₹ 3,697.59 / ha). It was also noticed that the highest expenditure on pesticide was seen on large farms (₹ 1,675 / ha) as compared to medium and small farmers. For the overall category of respondents, the per hectare cost of cultivation was ₹ 53360.49 which comprised of 77.30 per cent of variable cost and remaining 22.69 per cent was accounted for fixed cost items. With respect to returns analysis, the gross returns obtained by large farmers was higher (₹ 92,256.87 / ha) as compared to small and medium farmers (₹ 83,875.29 / ha and ₹ 86,812.95 / ha respectively). Net returns per hectare obtained were high in the case of large farmers were high (₹ 36,758.83 / ha) as compared to small and medium farmers (₹ 31,960.34 / ha and 34,144.67 / ha respectively). Since yield obtained by the large farmers was the highest i.e. 25.75 q / ha as compared to small and large i.e. 23.73 and 24.36 q / ha because of operation of economies of scale and proper utilization of productive resources. And use of chemical fertilizers which was the most responsive. And also better output price realized by them than by other counterparts, similar observations found with Ankit (2009) and Sangamesh (2015)

5.4 Resource use efficiency in soybean cultivation

5.4.1 Estimated Cobb-Douglas production function coefficients

The Cobb- Douglas type of production function with gross income realized from soybean output as dependent variable while expenditure made on seed, fertilizers and FYM, labourers and PPC as independent variables were used to study the resource use efficiency. The results presented in Table 4.9 revealed that the variables included in the function explained 80 per cent, 88 per cent and 91 per cent variation in the dependent variable on small, medium and large farmers respectively. Increasing returns to scale were observed for medium (1.10) and large farmers (1.05), whereas decreasing returns to scale was observed for small farmers (0.98). Here medium farmers getting more returns to scale compared to other categories of farmers because of operation of economies of scale and proper management of resources in the production process.

The estimated production parameter, for Human labour was (-0.17) negative and fertilizers (0.62) coefficients were positive and significant at one per cent, while seed (0.136) was significant at five per cent, PPC (-0.03) coefficients was negative and significant at five per cent, for small farmers. In medium farmers the seeds (0.653), FYM (0.128) bullock labour (0.017) and machine labour (0.136) were positive significant at one per cent. While fertilizers (0.182) co-efficient was positive and significant at five per cent. Whereas, in case of large farmers FYM (0.815) was positive and significant at one per cent, human labour (-0.49) was negative and significant at one percent. While seeds (0.87) was positive and significant at five percent, fertilizers (-0.031) was negative and significant at five per cent.

The overall output elasticities of seed, FYM were positive and significant, which implied the increased usage of these inputs added to the gross income. Since, the soybean crop was labour intensive and the operations such as ploughing, inter cultivation, manures application, hand weeding, spraying of plant protection chemicals, which significantly contributed towards increased yield and thus the income. The other inputs such as human labour machine labour and fertilizer coefficients were negative but significant and had negative impact on gross income. Plant protection chemicals utilization was seen relatively high in the case of only large farmers because of easy access to funds and in the anxiety to get better yield appeared to spent slightly more on PPC.

5.4.2 MVP to MFC ratios of resources in soybean production

The ratio of Marginal Value Product (MVP) to Marginal Factor Cost (MFC), presented in the Table 4.10 revealed that allocative efficiency was positive and greater than unity in the case of seeds, manures, bullock labour, and PPC indicating that still there was scope to use these inputs and increase the gross returns of soybean production in the study area.

In case of small farmers the MVP to MFC ratio for seed (2.77), Bullock labour (6.26), Fertilizers (14.62) were more than one indicating that still there is scope for higher utilization of these inputs and which in turn would increase the gross income and hence maximize their profit in soybean production. While, human labour (-1.51), machine labour (-0.91) and PPC (-1.71), FYM (0.53) were negative, which revealed that excessive use of these inputs reduced the gross income.

In the case of medium farmers, the MVP to MFC ratio for seeds (13.47), FYM (2.45), machine labour (2.02) and fertilizer (4.13) were more than one indicating that still there was scope for higher utilization of these inputs and which in turn would increase the gross income. While Human labour (-0.016) bullock labour (0.21) and PPC (-0.41) was negative, which revealed that excessive use of these inputs will reduce the gross income.

In case of large farmers indicated that seed (18.78), FYM (15.22), and PPC (1.28) were more than one indicating scope for higher utilization of these inputs. Which in turn would increase the gross income. This would help to maximize their profit in soybean production. While, the ratio of machine labour (-3.98), Bullock labour (-0.42) and Machine labour (-1.31) fertilizers (-0.67) input suggested that they need to reduce expenditure on these as revealed by ratio being less than zero (negative).

5.5 Marketing margins and price spread in different channels in the marketing of soybean

Production of any farm commodity completed only when it reached to the consumer. The marketing process, therefore, had been regarded as a part and parcel of the production activity. It was said that the Indian farmer was a good producer but a bad marketer. The ultimate success in marketing of any commodity largely depended upon the ease and significance in the marketing of soybean. The price of soybean is highly fluctuating hence, the study of marketing organizations and the various market functions involved in marketing of soybean was important.

Due to the peculiarities of agricultural products, they posed a number of problems in handling, transporting and marketing.

From the Table 4.11, with respect to soybean marketing which revealed that channel-III was more efficient than channel I, and channel II where producer's share in consumer's rupee was 92.38 per cent. As, in this channel there was only one intermediary i.e. village merchant. The farmers themselves supplied the produce to village merchant. It gave them good returns compared to channel- I and channel –II. The price spread was 246.10. In channel I there were more intermediaries and through this channel produce had transacted in the study area. The village merchants and wholesalers were permanent market players so farmers supplied their produce through this channel- I. the producer share in consumer rupee in channel- I was 87.24 per cent. The price spread was 463. In channel-II there were two intermediaries and through this channel produce had transacted in the study area. The trader or commission agents and wholesalers were permanent market players so farmers supplied their produce through this channel- I. The producer share in consumer's rupee in channel- II was 87.78 per cent. The price spread was 402. Similar observation expressed by Chaval et al. (2014).

5.6 Problems in production, and marketing of soybean

Production problems

The opinion survey conducted to elicit the problems faced by the sample farmers in the production of soybean are discussed here and results depicted in table 4.12.

From the study it was observed that majority of respondents opined, as non-availability of labour, high cost of labour, non-availability of inputs and lack of credit facility at right time which was ranked I, II and III, IV with a mean score of 69.84, 65.33, 55.37, 51.09 and respectively. The problem of non-availability of labour is because of soybean is a labour intensive crop and availability of the labour was a problem especially during the peak time of harvesting, weeding season which coincides with other agriculture operations. Farmers expressed the problem of non-availability of fertilizers in time because inadequate amount of fertilizer stock in study region. Farmers faced the problem of non-availability of credit in time. They could not get credit from institutional agencies and all they borrowed was from money lenders. This has resulted in high cost of borrowing.

Marketing problems

Almost all the sample farmers expressed fluctuation in price as a major problem followed by high cost of transportation, poor transport facility, absence of regulated markets and distant market were the major problem in the study area. Bad climatic conditions unscrupulous activities such as hoarding by the traders and suspension of trade were the reasons for such fluctuation in prices. And lack of connectivity to markets, absence of good roads. Most of the farmers don't have their own vehicles to transport. Similar remarks were made by Ahiwar *et al.* (2014).

6. SUMMARY AND CONCLUSIONS

Soybean is grown primarily during *kharif* season almost throughout India and occupies nearly 80 per cent of the total area. The *Rabi* crop amounts for the remaining 20 per cent of the total area. The important states in India growing maximum soybean crop are Madhya Pradesh Maharashtra Rajasthan, Andhra Pradesh and Karnataka. They occupied respectively 62.60, 38.70, 10.58 and 2.84, 2.47 lakh hectare. Soybean was practically a *kharif* crop. Soybean contains about 40 per cent protein, this being about double the protein content of green gram, nearly same as wheat. The protein is comparatively rich in lysine, which is deficient in cereal grains.

In Karnataka, major soybean growing districts are Belagavi, Dharwad, Bagalkot and Bidar. Belagavi district stands first position with the production of 41,821 tonnes with an of 66,769 hectares followed by Dharwad district with the production of 16,347 tonnes in area of 28,676 hectares and Bagalkot district with the production of 8,234 tonnes in the area of 11,034 hectares. The major varieties grown in study area are JS 335, DSP 21.

The efficient marketing of soybean plays an important role in increasing the producer's share in consumer's rupee and maintains the tempo of increased production. In India, oil seed marketing in general and soybean marketing in particular is mainly in the hands of middleman like village merchants, wholesalers and private processor. Hence, the producer is only a price receiver. Therefore, many a times soybean producers have a resorted to distress sale due to uncertain situation in the marketing of oil seeds. In the progress of marketing the producer has to incur various marketing costs. Agricultural marketing is costly with high commission charges, trader's profit margins, wastages and malpractices. The costs are determined by the performance and efficiency of different marketing functionaries in different channels which in turn influence the return to the producer. Keeping in view the malpractices such as unauthorized deduction, false weights, faulty grading, spoilage, excessive market charges and low price paid to the farmers, the tactics which traders use to exploit the farmers. Government sought to remedy the situations through the establishment of regulated markets. The study proved the hypotheses set at the beginning of the investigation.

The specific objectives of the study are

1. To estimate trends in area, production and productivity of soybean in Belagavi district
2. To estimate the cost and returns in soybean production.
3. To analyse resource use efficiency in soybean production.
4. To identify the channels of marketing of soybean and estimate the producer's share in consumer's rupee.
5. To identify the constraints in production and marketing of soybean.

6.1 Methodology

The multi-stage random sampling procedure was adopted to choose the sample farmers (respondents). In the first stage, Belagavi District was selected based on highest soybean area. In second stage, taluks having the highest area under soybean were selected. Two villages from each taluk under Soybean crop were selected in the third stage. From Bailhongal taluk (Bailwad and

Anagol villages), and from Hukkeri taluk (kurnewadi and Kurni villages) were selected for the purpose. Finally, sample of thirty farmers were selected from each of these selected villages randomly. And two markets were selected from each taluk and five intermediaries each were selected for enumerating the data. Thus, the total sample size chosen for the present study was 140. The primary data relating to land utilization, asset position, cropping pattern, the details of the cost of cultivation of soybean, output, and prices obtained by farmers in the marketing were collected from the selected farmers using the pre tested schedules. The data pertained to the agricultural year 2014-15. In order to achieve the objectives of the study, the technique of tabular analysis and budgeting technique were employed for estimating the cost and returns of Soybean. The Cobb-Douglas type of production function was fitted to estimate the production elasticities of the resources used in Soybean production in the study district, Garret ranking was used in study.

6.2 Major findings

6.2.1. Socio-economic characteristics of the sample respondents the average age of the sample respondents was 43.66 years. Majority of the respondents families were nuclear having equal number of male and female. More than 90 per cent of respondents doing agriculture as a main occupation. The highest literacy percentage was seen in large farmers (85 %) compared to medium (81.40 %) and small farmers (71.93 %). Most of the farmers educated up to middle school.

The average size of land holding was 2.85 ha with 0.21 ha as leased in land and 0.03 ha as leased out land. Respondents grown soybean on 1.59 ha of land with almost majority of cereals, pulses and oil seed crops being included in their cropping pattern.

With respect to trends in area, production and productivity of soybean in Belagavi district. It was observed that growth rates in area production and productivity of soybean of Belagavi district were 3.33 per cent, 1.29 per cent and -1.98 per cent respectively, the growth rates of area, is positive significant. And production was positive but non-significant, productivity was negative and non-significant.

6.2.3 Cost and returns from soybean cultivation

Among the three categories of farmers the total cost incurred by the large farmers was the highest (₹ 55,498.04 / ha) as compared to medium and small farmer (₹ 52,668.28 / ha and ₹ 51,914.95 / ha). Net returns per hectare obtained by large farmers were the highest (₹ 36,758.83 / ha) as compared to medium and small farmers (₹ 34,144.67 / ha and ₹ 31,960.34 / ha respectively). The gross returns obtained per hectare by overall category of farmers were ₹ 87,620.50 with a yield of 24.61 q / ha. The total variable cost incurred per hectare by large farmers was high (₹ 43,266.08 / ha) as compared to medium and small farmers (₹ 40555.98 / ha and ₹ 39935.93 / ha respectively). And B: C Ratio was 1.64 for the overall study area.

6.2.4 Resource use efficiency

The inputs included in model explained 80 per cent (small farmers), 88 per cent (medium farmers), 91 per cent (large farmers) variation in soybean output as revealed by the coefficient of multiple determination (R^2). The summation of regression coefficients indicated increasing returns to scale for medium (1.10) and large farmers (1.05), whereas decreasing returns to scale were observed for small farmers (0.98).

The estimated production parameter, for Human labour (-0.17) negative and fertilizers (0.62) coefficients were significant at one per cent, while seed (0.136) was significant at five per cent, PPC (-0.03) coefficients was negative and significant at five per cent, for small farmers. In medium farmers the seeds (0.653), FYM (0.128) bullock labour (0.017) and machine labour (0.136) were positive significant at one per cent. While fertilizers (0.182) co-efficient was positive and significant at five per cent. Whereas, In case of large farmers FYM (0.815) was positive and significant at one per cent, human labour (-0.49) was negative and significant at one percent. While seeds (0.87) was positive and significant at five percent, fertilizers (-0.031) was negative and significant at five per cent.

In case of small farmers the MVP to MFC ratio for seed (2.77), Bullock labour (6.26), Fertilizers (14.62), while in the case of medium farmers, the MVP to MFC ratio for seeds (13.47), FYM (2.45), machine labour (2.02) and fertilizer (4.13). In case of large farmers indicated that seed (18.78), FYM (15.22), and PPC (1.28) were more than one indicating that still there was scope for higher utilization of these inputs and which in turn would increase the gross income. This would help to maximize their profit in soybean production. While, the ratio in case of overall category seeds (20.60), FYM (12.98) and PPC (1.52) were more than one. And the machine labour (-0.12), fertilizer (-0.27) and Human labour (-3.49), bullock labour (0.77) input suggested that there were need to reduce expenditure on these as revealed by ratio its being less than zero (negative).

6.2.5 Marketing cost and price spread in soybean cultivation

The marketing analysis reveals that, with respect to soybean the channel-III was seen more efficient than channel I, and channel II where producer share in consumer rupee was 92.38 per cent. The price spread was 246.10. The producer share in consumer rupee in channel-II was 87.78 per cent. The price spread was 402. And the producer's share in consumer's rupee in channel-I was 87.24 per cent. The price spread was 463. Here channel III was more efficient.

From the study it was observed that majority of respondents opined, as non- availability of labour, non-availability of inputs as a major constraints. The problem of non-availability of labour was due to the fact that soybean is a labour intensive crop and availability of the labour was a problem especially during the peak time of harvesting and weeding season which coincides with other agriculture operations. Farmers expressed the problem of non-availability of fertilizers in time because inadequate of fertilizer stock in study region. Farmers faced the problem of non-availability of credit in time. They could not get credit from institutional agencies and all they borrowed was from moneylenders. This has resulted in high cost of borrowing. The main constraints in marketing of soybean were price fluctuation, high transportation cost. Arrival of large quantity to the market at the same time, bad climatic conditions unscrupulous activities such as hoarding by the traders and suspension of trade were the reasons for such fluctuation in prices. And lack of connectivity to markets, absence of good roads.

6.3 Policy Implications

1. Despite the remunerative returns and immense importance of soybean it is rather unfortunate that this sector could not achieve the required level of development. In this regard based on scientific information of the field survey carried and after analysing thoroughly the following policy recommendations are drawn for the benefit of the future researchers and policy makers. Majority of soybean growers in the study area were belonged to middle aged (43, 66 years) with literacy rate of (80 %) revealing stronger ability to bear risks to adopt innovative technologies. Hence, to harness the potentiality and abilities of these risk bearing middle aged group new technologies in soybean like JS 335, DSP 21 Eagle for higher production needs to be popularised.
2. The growth in area and production over past fourteen years observed was positive and fluctuating in alternative years, but productivity observed negative and non significant because of mono cropping and high incidence of pest so farmers need to be educated about integrated pest management and crop rotation.
3. Cost incurred by the farmers on human labour compared to machine labour was high and bullock labour, which increased the variable cost. Hence, these resources need to be optimally utilised or partial mechanisation by the farmers may be adopted for better efficiency.
4. The resource use efficiency analysis revealed that the seeds, FYM, and PPC were underutilised, while human labour, machine labour, bullock labour, and fertilizer, were over utilised. Hence, there is a necessity to impart training to the soybean growers for optimal utilisation of the resources through whole farm demonstrations.
5. The producer's share in consumer's rupee was found the highest in channel III (92.38 %) compared to channel I and channel II, Hence, the farmers are advised to market their produce through channel III to harness more profit.
6. The constraints faced by the farmers of soybean revealed that the market price fluctuation (64.36) is the major problem followed by lack price dissemination, so the government should take care for proper regulation and timely dissemination of market price to farmers.

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APPENDIX

Schedule

“Production and Marketing of Soybean in Belagavi District of Karnataka- An Economic Analysis”

Schedule No:

Date:.....

A) General Information of respondents:

- 1) Name of the respondent: Age (in years).....
2) Village..... Taluk
3) Educational level of the farmer: Illiterate/Lower Primary (1-5)/
Higher Primary(6-8)/ High School(9-12)/
Graduate and Post – Graduate

4) Family type: Nucleus / Joint Male: Female: Total:

5) Family Composition:

| Sl. No | Name | Relation With responders | Age | Education level | Occupation | | Other |
|--------|------|--------------------------|-----|-----------------|------------|------------|-------|
| | | | | | Main | Subsidiary | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |

6) Social participation: ZP/TP/VP/NGO/SHG/other

7A) Land holdings : acre/ha Type of soil:

| Sl. No. | Particulars | Irrigated (acres) | Dry land (acres) | Total (acres) |
|---------|-------------|-------------------|------------------|---------------|
| 1 | Owned | | | |
| 2 | Leased- in | | | |
| 3 | Leased –Out | | | |
| 4 | Fallow | | | |
| | Total | | | |

7B) Sources of Irrigation: Open Well/Bore well/ Canal/ Tank/ Farm pond /others if any.....Area-Irrigated (Acres):.....

B 1) Asset position

| Sl. No. | Types of asset | No.s | Year of purchase/ construction | Purchase or construction value | Junk value | Expected life span |
|---------|--|------|--------------------------------|--------------------------------|------------|--------------------|
| 1 | Buildings | | | | | |
| 2 | Bullock cart | | | | | |
| 3 | Livestock a)cows b) Buffalo c) Sheep d) Goat e) Others if any a) b) c) | | | | | |
| 4 | Tractor | | | | | |
| 5 | Implements 1) Pump set 2) Irrigation equipments 3) Farm equipments 4) Plough 5) Harrowing 6) Seed drill 7) Others, if any a) b) c) | | | | | |

B 2) SOURCE OF INCOME:

| Sl. No. | Source | Annual income(Rs/annum) |
|---------|-----------------------------------|-------------------------|
| 1. | Agriculture and allied activities | |
| 2. | Business | |
| 3. | Govt. Jobs | |
| 4. | Wages | |
| 5. | Others | |

SOURCE OF FUNDS:

i.) Owned (Rs. _____) ii.) Borrowed (Rs. _____)
If borrowed, what are the sources of credit?

| Sl. No. | Source of Credit | Amount of loan (Rs.) | Interest rate (%) | Year of loan obtained | Repayment made (Rs.) | Outstanding amount (Rs.) | Remarks |
|---------|------------------|----------------------|-------------------|-----------------------|----------------------|--------------------------|---------|
| 1. | | | | | | | |
| 2. | | | | | | | |

B 3) CROPPING PATTERN:

| Sl. No | Season | Crop | Variety | Irrigated (acre) | Rainfed (acre) | Total (acre) | Output(Qt) | | Value (Rs./qt) |
|--------|--------|------|---------|------------------|----------------|--------------|--------------|------------|----------------|
| | | | | | | | Main product | By product | |
| 1. | Kharif | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 4 | | | | | | | |
| 2. | Rabi | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 4 | | | | | | | |
| 3. | Summer | 1 | | | | | | | |
| | | 2 | | | | | | | |
| | | 3 | | | | | | | |
| | | 4 | | | | | | | |

C1): COST AND RETURNS OF SOYBEAN

1. Variety:
2. Area(acre):
3. Soil type
4. Season:K/R/S
5. Type of land: Dry / Irrigated. If, irrigated, source of irrigation:

C 2) Input cost

| Sl. No. | Inputs | Qty. (per acre) | Rate (cost/unit) | Total cost(₹) |
|---------|--|-----------------|------------------|---------------|
| 1 | Seeds | | | |
| 2 | FYM | | | |
| 3 | Manures | | | |
| 4 | Chemical fertilizers a) Urea b) DAP c) SSP d) MOP e) Others,if any i) ii) | | | |
| 5 | Weedicides /PPC/ growth regulators a) b) c) | | | |
| 6 | Irrigation charges | | | |
| 7 | Others, if any a) b) c) | | | |

LABOUR WAGE RATE (EIGHT HRS. PER DAY)

Male: Female:

Bullock pair: Tractor (per hour):

C3) Farm operations and labour employed

| S N | Name of the operation | No. of times | Family | | | | Hired | | | | Total |
|--------|--------------------------|--------------------|--------|---|----|---|-------|---|----|---|-------|
| | | | M | W | BP | T | M | W | BP | T | Cost |
| 1 | Ploughing | | | | | | | | | | |
| 2 | Clod crushing | | | | | | | | | | |
| 3 | Harrowing | | | | | | | | | | |
| 4 | Transportation of FYM | | | | | | | | | | |
| 5 | Spreading of FYM | | | | | | | | | | |
| 6 | Fertilizers application | | | | | | | | | | |
| 7 | PPC application | | | | | | | | | | |
| 8 | Seed treatment | | | | | | | | | | |
| 9 | Marking lines and sowing | | | | | | | | | | |
| 10 | Gap filling | | | | | | | | | | |
| 11 | Intercultivation | | | | | | | | | | |
| 12 | Irrigation | | | | | | | | | | |
| 13 | Spraying/ dusting | | | | | | | | | | |
| 14 | Weeding | | | | | | | | | | |
| 15 | Harvesting&threshing | | | | | | | | | | |
| | Total: | | | | | | | | | | |

NOTE: M-Men, W-Women, BP-Bullock pair, T-Tractor.

C4) Yield obtained and Returns realized:

| Sl. No. | Particulars | Quantity (Qtl.) | Price (Rs/qtl) | Total Returns (Rs.) |
|---------|--------------|-----------------|----------------|---------------------|
| 1. | Main product | | | |
| 2. | Byproduct | | | |

D) Marketing of output

| Sl. No | Place of sale | Time /Month of sale | To Whom sold | Qty. Sold (Qtls/Bags) | Price (Qtl/bags) | Total amount(₹) | Any commission charges(₹) |
|--------|---------------|---------------------|--------------|-----------------------|------------------|-----------------|---------------------------|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |

1 Bag..... kg

E) Marketing costs

| Sl. No. | Items | Total Costs (₹) |
|---------|-------------------------------|-----------------|
| 1 | Packing materials | |
| 2 | Packing charges | |
| 3 | Transportation | |
| 4 | Loading and Unloading charges | |
| 5 | Weighment | |
| 6 | Any others if any a) b) | |

Constraints in Production and Marketing of Soybean

a) Production constraints

| S no | Problems | rank |
|------|--|------|
| i) | Non – availability of seed on time | |
| ii) | Non – availability of fertilizer on time | |
| iii) | Lack of irrigation facility | |
| iv) | Non – availability of labour on time | |
| v) | Non- availability of Technical guidance | |
| vi) | Any other specify: | |

b) Marketing constraints

| | Problems | rank |
|------|-----------------------------------|------|
| i) | Lack of Transportation facilities | |
| ii) | High cost of Transportation | |
| iii) | Fluctuation in market prices | |
| iv) | Absence of regulated markets | |
| v) | Distant market | |

Schedule-B

MARKET FUNCTIONARIES

Village Merchant/wholesaler cum Commission Agent /Retailers

I. General information

- a) Name of the Respondent
- b) Type of market function performed
- c) Location
- d) Age (in years)
- e) Education

II. Details of marketing activities of Soybean during the year (2015-2016)

| Products (Qty) | purchased/handled | Purchase price(₹/qtl) | Qty loss/ if any | Qty sold | Sale price (₹/qtl) | Commission charges (₹/qtl) |
|----------------|-------------------|-----------------------|------------------|----------|--------------------|----------------------------|
| | | | | | | |
| | | | | | | |
| | | | | | | |

III. Marketing costs and margins

| Sl.No. | Particulars | Qty | Unit | Amount(₹) |
|--------|---------------------|-----|------|-----------|
| 1 | Establishment | | | |
| 2 | Shop rent | | | |
| 3 | Labour wages | | | |
| 4 | Transportation cost | | | |
| 5 | Storage cost | | | |
| 6 | Storage losses | | | |
| 7 | Tax | | | |
| 8 | Miscellaneous cost | | | |

IV. Market Finance availed for the business

| Sl. No. | Source | Amount of Loan(₹) | Year of loan | Rate of Interest(₹) | Amount Repaid(₹) |
|---------|--------|-------------------|--------------|---------------------|------------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

V. Inventory of Machinery/Equipment and Buildings

| Sl. No. | Particulars | Year of purchase/ Construction | Purchase Value | Junk Value | No. of years of useful service |
|---------|-------------------------------|--------------------------------|----------------|------------|--------------------------------|
| 1 | Building Shopcum Godown | | | | |
| 2 | Truck/Tractor | | | | |
| 3 | Others ,if any | | | | |

VI. Marketing Channels:

- I
- II
- III

PRODUCTION AND MARKETING OF SOYBEAN IN BELAGAVI DISTRICT OF KARNATAKA - AN ECONOMIC ANALYSIS

YOGANANDA R. E.

2016

DR. M. T. SHARMA
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ABSTRACT

Soybean (*Glycine max* (L). Merrill.) is a major oil seed crop in the world. It is known as golden bean and miracle crop because of its several uses. The multistage sampling procedure was adopted for selection of 120 sample farmers from Belagavi district. The results indicated that growth in area was positive and significant at 3.33 per cent per annum and production was positive but non-significant at 1.29 per cent per annum but productivity showing negative growth rate -1.98 per cent per annum.

Among the different categories of farmers, the total variable cost incurred by large farmers was highest (₹ 43,266.08 / ha) as compared to medium (₹ 40,555.98 / ha) and small farmers (₹ 39,935.93 / ha). And the total cost incurred by the large farmers was highest (₹ 55,498.04 / ha) as compared to medium and small farmers (₹ 52,668.28 / ha and ₹ 51,914.95 / ha) respectively. The highest returns was obtained by large farmers (₹ 92,256.87 / ha) followed by medium farmers (₹ 86,812.95 / ha) and small farmers (₹ 83,875.29 / ha). The benefit cost ratio (BCR) was highest in large farmers (1.66) than medium and small farmers (1.64 and 1.61 respectively). Decreasing returns to scale was observed in small farmers, (0.98) where as an increasing returns to scale was observed in medium and large farmers (1.10 and 1.05 respectively). The marketing analysis revealed that channel-III have more producer's share in consumer's rupee (92.38 %) than channel-I (87.24 %), and channel-II (87.78 %). Non-availability of labour and high cost of labour were the main constraints in soybean production and fluctuation of market prices was major constraint observed in marketing of soybean by most of the farmers.