ECONOMICS OF PRODUCTION AND MARKETING OF SOYBEAN IN YAVATMAL DISTRICT OF MAHARASHTRA

by

Rathod Umesh Subhash
(Reg. No.017/217)

MASTER OF SCIENCE (AGRICULTURE)

DEPARTMENT OF AGRICULTURAL ECONOMICS

POST GRADUATE INSTITUTE

MAHATMA PHULE KRISHI VIDYAPEETH
RAHURI-413722, DIST-AHMEDNAGAR
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MAHARASHTRA, INDIA
2019

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part
there of has not been submitted
by me or other person to any
other University or Institute
for a Degree or
Diploma

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Date : / /2019

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This is to certify that the thesis entitled. **"ECONOMICS OF PRODUCTION AND MARKETING OF SOYBEAN IN YAVATMAL DISTRICT OF MAHARASHTRA"** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra) in partial fulfilment of the requirements for the award of the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL ECONOMICS,** embodies the result of piece of bonafide research work carried out by **Mr. RATHOD UMESH SUBHASH** under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged.

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ACKNOWLEDGEMENT

I avail this opportunity to acknowledge all those who helped and guided me during the course of my research work.

Before giving way to my feelings, I cordially want to salute that supreme cosmic consciousness from which everything originates in the beginning and to which everything goes to end. Though formal and dead words cannot carry the fragrance of emotions with them, still they are the only available way of expressing emotions in such formal acknowledgement.

On the path of search for knowledge, one needs complementary guidance and this task was performed by my research guide Dr. A. V. Gavali, Field Officer (I), Comprehensive Scheme, Department of Agricultural Economics, MPKV, Rahuri. I express my sincere gratitude and indebtedness for his inspiring guidance, keen interest, constructive criticism, constant encouragement and immense sympathy during the preparation of this manuscript and PG life.

I am deeply indebted to Dr. A. L. Pharande, Dean, Faculty of Agriculture, MPKV, Rahuri, and Dr. Y. G. Fulpagare, Associate Dean, PGI, MPKV, Rahuri, for providing necessary facilities, useful suggestions and constant encouragement at all the time.

I extend my heartful thanks to the members of my Advisory Committee, Dr. D. B. Yadav, Head, Department of Agricultural Economics, Dr. C. A. Nimbalkar, Professor, Department of Statistics, Dr. U. S. Surve, Associate Professor, Department of Agronomy, MPKV, Rahuri. for their constructive criticism, valuable guidance and critical evaluation of this manuscript.

With deepest sense of gratitude, I wish to express my heartiest and profound thanks towards Dr. T. B. Deokate, Assistant Professor and Dr. R. B. Hile, Associate Professor, Department of Agricultural Economics, MPKV, Rahuri, who guided me, and their helpful comments, suggestions and co-operation helped me in completion of the present study.

I am under deep obligation for constant inspiration and constant criticism from Dr. V. G. Pokharkhar, Dr. R. R. Nirgude, Dr. B. H. Kamble, Dr. G. G. Joshi, Dr. U. S. Bondar, Dr. V. D. Waiwal, Dr. J. T. Dorge, Dr. S. B. Sapkal, Dr. D. J. Sanap and Dr. A. J. Amale for their co-operation in timely completion of my post graduate research work.

My research work would not have been superfine and super finished without the assistance and co-operation extended by Mr. Harish Raut and the staff members of Agricultural Economics department.

I wish to convey my heartful thanks to my department colleagues Avinash, Ganesh, Pranod, Vrushabh, Dipak, Amasiddha, Karthik, Krishna, Jaivik, Sumit, Punam, Pavitra Pooja, Yamini, Prashika, Vidya, my seniors and all juniors of 2018-20 batch whose excellent company and co-operation helped me in carrying out my study with joy and happiness.

There are no words to express my feelings of adoration, love, respect and obligation to my beloved parents, who moulded me to what I am. My dearest mother Mrs. Anita Rathod, and my beloved father Mr. Subhash Rathod, and my grandfather Late. Sajusing Rathod, my uncle Mr. Madhav Rathod, taught me to lead an obedient, trustworthy and simple life, which constantly guided as a lighted lamp and their ambitious encouragement, continued calm endurance, constant support and affection showered on me throughout my educational endeavour. I am so lucky to have caring and supporting sister miss. Sonu Rathod and brother Mr. Mahesh Rathod who stood as pillar behind me and helped me to make my future bright.

Thanks, are also extended to all other family members and relatives for their encouragement and affection during my higher studies.

I wish to convey my heartful thanks to my best friends Digambar, Ajay, Suraj, AK, JK, Shivraj, Saurabh, Piralal, Gopal, Parashram, Sandip, Chiku, Rushikesh, Prathmesh, Prashant, Amol, Dharmenra, and Umesh for their moral support and encouragement.

I acknowledge the guidance and advice extruded by my seniors especially, Mr. Sagar, Mr. Vaibhav, Mr. Kuldeep, Mr. Shantiram, Mr. Sandip, Mr. Dilip, Mr. Sandip Suryavanshi, Mr. Mukade sir, who directly or indirectly gave encouragement and humorous company all the way.

I would be failing my duties if I do not record deep sense of appreciation for the whole hearted co-operation and assistance provided for completing this work by soybean growers of Darwha and Digras tahsils of Yavatmal district. Last but not least my warm acknowledgment to farmers, soldiers, scientists and great social workers, who have devoted their life for the country.

Finally, I would like to thank one and all, who helped me directly or indirectly during this investigation.

Place : M.P.K.V., Rahuri

Date : / / 2019 ***(Rathod U. S.)***

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ABBREVITIONS

/	-	Per
Agril.	-	Agriculture
e.g.	-	Exampli gratia (For example)
Econ.	-	Economics
et. al.	-	et alia (others)
etc.	-	Etcetera
Fig.	-	Figure
ha.	-	Hectare
Lit.	-	Literature
No.	-	Number
i.e.	-	That is
J.	-	Journal
Kg.	-	Kilogram
q.	-	Quintal
Qty.	-	Quantity
Res.	-	Research
₹	-	Rupees
Univ.	-	University
Viz.	-	Videlicet (namely)
Mktg.	-	Marketing
Vol.	-	Volume
PP	-	Page number
@	-	At the rate
N	-	Nitrogen
P	-	Phosphorus
K	-	Potash
%	-	Per cent
m	-	Meter
hrs	-	Hours

ABSTRACT

ECONOMICS OF PRODUTION AND MARKETING OF SOYBEAN IN YAVATMAL DISTRICT OF MAHARASHTRA

by

Mr. Rathod Umesh Subhash
A candidate for the Degree

of

MASTER OF SCIENCE (AGRICULTURE)
In

AGRICULTURAL ECONOMICS
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2019

Research Guide	**:**	**Dr. A. V. Gavali**
Department	**:**	**Agricultural Economics**

Soybean as an oilseed crop introduced in India during 1970-71 onwards. It is one of the fastest growing and short durational crops. Oilseeds are an important segment of Indian agricultural economy as they contribute one tenth to total output of crop sector in the country.

The present investigation has been undertaken in Yavatmal district of Maharashtra. Keeping in view the highest acreage under soybean, Darwha and Digras tahsils from Yavatmal district were selected purposively according to area under soybean. Three villages from each tahsil were selected randomly and from six villages, 15 Soybean farmers were selected from each village on the basis of actual area under soybean. All the 15 Soybean farmers were categorized into three different groups (five in each group), i.e. small (0.01 to 0.40 ha), medium (0.41 to 0.80 ha) and large (0.81 ha and above).

Thus, final sample comprised of 90 soybean growers. The primary data collected for the agriculture year 2018-19 were analyzed by using simple tabular approach and functional analysis method.

At overall level, the per hectare cost of cultivation of soybean worked out to be ₹ 45588.49 The cost ‘A’ was ₹ 29613.43 contributing 64.17 per cent share in the cost ‘C’. In cost ‘A’, the major item of cost was total hired human labour i.e. ₹ 5287.40 contributing 11.46 per cent share in the cost ‘C’. The per hectare expenditure on machine power was worked out to ₹ 3039.62 contributing 6.59 per cent share in the cost ‘C’.

The expenditure on bullock labour, manure, seed, fertilizer, plant protection charges and weedicide were worked out to ₹ 837.67, 2515.38, ₹ 4816.46 ,₹ 4490.97, ₹ 845.80 and ₹ 1478.92 which accounted for 1.82, 5.45, 10.44, 9.73, 1.83 and 3.20 per cent share in cost 'C' respectively.

At the overall level, the per hectare gross return was found to be ₹ 53556.28. The per hectare gross returns of soybean in small, medium and large size group was ₹ 55894.08, ₹ 57248.81 and ₹ 51666.87, respectively.

At overall level B:C ratio at cost 'C' was 1.17. It clearly indicated that, the soybean cultivation is a profitable venture.

The results of cobb-Douglas production function showed that, human labour (X_1), machine (X_3), nitrogen (X_6), phosphorus (X_7), potash (X_8), and plant protection (X_9) were positive and significant influencing the yield of soybean.

Production and disposal pattern of soybean showed that, 97.89 per cent of produce is marketed. In marketing of soybean three marketing channels were identified among which channel II: Producer- Commission agent- Wholesaler- Processor was mostly preferred by grower. Maximum farmer used channel II followed by Channel III and Channel I. The average per quintal price spread for soybean was 550.82, 570.67, and 512.23 ₹/q for Channel I, Channel II and Channel III, respectively. The Channel-III with marketing efficiency of 6.47 was most efficient followed by Channel I (5.85), and Channel II.

The major problems faced by the soybean farmers in the production aspects were non-availability of labour in time, high wage rate, lack of availability of quality seed, high cost of seed, high cost of fertilizers, lack of technical knowledge, high cost of insecticides and pesticides, insufficient institutional credit available in time, etc.

The efforts should be made to raise the managerial ability in the field of both production and marketing of soybean. As far as possible the technical guidance should be made more advanced and effective to produce more and market efficiently.

1. INTRODUCTION

In India, soybean as an oilseed crop introduced in 1970-71 onwards. It is one of the fastest growing and short durational crops in India. Oilseeds are an important segment of Indian agricultural economy as they contribute to one tenth of total output of crop sector in the country. India is the fortunate in having a wide range of oilseed crops grown in its different agro-climatic zones. India is the third largest producer of oilseeds in the world. The oilseed crops grown by adopting new technology in India are groundnut, soybean, safflower, sunflower, mustered, linseed, castor, etc. Among the oilseed crops, soybean occupies an important position next only to groundnut. The oilseed crops occupy an important place in Indian farming as they provide vegetable fat to the Indian diet, they provide raw material for many industries. They can be grown in all kinds of soils and are important constituents of crop rotation with millet and pulses. Oilseeds are the second largest agricultural commodities in India after cereals.

In India, the per capita consumption of edible oil is about 17 kg per annum, which is very less as compared to 25 kg in the developed countries. Oil and fats constitute essential ingredients of human diet. Oilseeds are the main source of edible fat as they are rich in proteins and acts as raw material for several processing industries. India is the largest producer of oilseeds in the World. India accounts for 7.4 per cent of world output of oilseeds. Even then, presently India has emerged as the largest importer of edible oil and more than 40 per cent of domestic demand is met through such imports. In order to frame proper policies for this sector, we need to look at demand and supply side. Presently, the supply of oilseeds has been lagging behind the actual requirement. Crops used as oilseeds grown in the World are soybean, cottonseed, rapeseed, groundnut, palm kernel, sunflower seed and copra. Soybean alone ranks first in the production of oilseeds in the World.

1.1 Importance of Soybean

Soybean *(Glycine max L.) is* known as 'Golden Bean' of the 20th century. Though, soybean is legume crop yet it is widely used as oilseed. Due to poor cooking ability and digestibility on account of inherent presence of trypsin inhibitor, it cannot be utilized as pulse. It can be grown under varied agro-climatic conditions; hence it has emerged as one of the important commercial crops in many countries. Due to its worldwide popularity, the international trade of soybean is spread globally. Several countries such as Japan, China, Indonesia, Philippines, Iran and European countries are importing soybean to supplement their domestic requirement for human consumption and cattle feed. Soybean has great potential as exceptionally nutritive and very rich protein food. It can supply much needed protein to human diet, because, it contains 40 per cent protein of superior quality and all the essential amino acids particularly glycine, tryptophan and lysine, similar to cow's milk and animal proteins. Soybean also contains about 20 per cent oil with an important fatty acids, lecithin and vitamin A and D. The 4 per cent mineral

salts of soybean are fairly rich in phosphorous and calcium. Soybean is kharif legume crop, legumes have well recognized role in restoring soil fertility and improving soil physical property. It fixes nitrogen from atmosphere to soil up to 15-30 kg per hectare per year and also adding the leaves and straw to the soil consisting of 9 per cent nitrogen, 12 per cent phosphorous and 8.9 per cent potash. They valued for protein rich food, feed and fodder. Therefore, have been rightly described as unique "Jewell of Indian" crop husbandry.

1.2 Soybean Production in the World

Although a native of China, soybean for all practical reason is an American crop today. USA is the major producer of soybean and ranks first in production. Its share in the world production was almost 34.45 per cent (2017-18). Brazil, Argentina and China ranked second, third and fourth position in terms of production, respectively. India occupies fifth place in the production of soybean with 2.74 per cent of world production.

1.3 Soybean Production in India

In India, the total area under soybean crop had increased from 6.11 million hectare in 2002 to 11.18 million hectares in the year 2016-17, and production from 4.65 million metric tonnes to 13.58 million metric tonnes in the year 2016-17. The major soybean growing states in India are Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Gujarat. Madhya Pradesh rank first in area (54.01lakh hectares) followed by Maharashtra (38.40 lakh hectares), Rajasthan (10.55 lakh hectares), Karnataka (3.18 lakh hectares), Telangana (2.77) and Gujarat (1.20 lakh hectares). Also, in production of soybean, Madhya Pradesh rank first (66.49 lakh MT) and second Maharashtra (48.56 lakh MT) followed by Rajasthan (11.31 lakh MT), Telangana (3.22 lakh MT) and Karnataka (2.37 lakh MT) during the year 2016-17.

Table 1.1. Area, Production and Productivity of Soybean in India (2010 to 2016)

Year	Area (M. ha)	Production (M. Metric Tons)	Productivity (Kg/ha)
2010-11	9.60	12.74	1327
2011-12	10.18	12.28	1207
2012-13	10.84	14.66	1353
2013-14	11.71	11.86	1012
2014-15	10.91	10.37	951
2015-16	11.60	8.56	738
2016-17	11.18	13.58	1177

(Source: www.agricoop.nic.in)

Table 1.2. State wise Area, Production and Productivity of Soybean

(2016-17)

States	Area (000 ha)	Production (000 Tonnes)	Productivity (kg/ha)
Chhattisgarh	104.10	72.60	697
Gujarat	120.00	86.00	717
Karnataka	318.00	237.00	745
Madhya Pradesh	5401.00	6649.00	1231
Maharashtra	3840.80	4586.70	1194
Nagaland	24.98	31.41	1257
Rajasthan	1055.61	1131.81	1072
Telangana	277.00	322.00	1162
Uttarakhand	12.00	13.00	1083
Others	29.92	29.19	945
Total	**11183.41**	**13158.73**	**1177**

(Source: www.agricoop.nic.in)

1.4 Soybean Production in Maharashtra

Soybean was introduced in Maharashtra during nineties (1984-85). It became popular because of its short durational nature (90-110 days) with higher productivity as compared to other pulses both under rainfed as well as irrigated condition. The area and production of soybean had shown a continuously increasing trend during the last two decades. The average yield for soybean realized in Maharashtra was around 12.43 q/ha as against the productivity potential of about 20-25 q/ha. This indicated that though the area under soybean was increasing, there is a wide gap between the potential yield and the actual yield on farmer's field. Maharashtra has second rank in soybean area and production in India. Area under soybean was 3.84 million hectares with production of 4.58 million metric tonnes and productivity of 1194 kg/ha in kharif season of 2016-17 (Source: www.krishi.maharashtra.in).

The major soybean growing districts in Maharashtra are Buldhana, Latur, Amravati, Yavatmal, Washim, Nanded, Akola and Hingoli. In Maharashtra Buldhana district rank first in production (7.03 lakh MT) and second in area (3.65 lakh hectare) while Latur rank first in area (3.70 lakh hectares) and fifth in production (2.79 lakh MT) during the year 2016-17 (Source: www.krishi.maharashtra.in).

1.5 Soybean Production in Yavatmal District of Maharashtra

Vidarbha region of Maharashtra is major soybean growing area. The area under soybean in Vidarbha region was 19.20 lakh hectares with the production of 26.98

lakh MT and average productivity of 1307 kg/ha in the year 2016-17. The major soybean growing districts in Vidarbha region are Buldhana, Washim, Amravati, Akola, and Yavatmal. Soybean shown increasing trend in respect of area during the last decade. Though Soybean is recently introduced in Maharashtra, soybean farmers are now attracted towards soybean cultivation. In Maharashtra, Yavatmal district rank 6th in area as well as in production.

1.6 Topic of the Study

The farmers are attracted towards soybean cultivation due to its suitability and profitability. Therefore, Yavatmal is purposively selected for the study. The study has been planned to explore various aspects of soybean with respect to production and marketing. There are very few studies conducted on economics of production and marketing in Maharashtra in general and for Yavatmal district in particular. Therefore, the main objective of the present investigation was to probe into economic analysis of production and marketing of soybean in Yavatmal district. The study would provide guidelines and direction for proper use of resources for maximization of profits. The study would also be useful in selecting appropriate cropping system for study area. When soybean crop had entered into existing cropping pattern of producers in study area by replacing some other kharif crops, claiming that it is relatively profitable. However, there are other advantages like less duration of the crop and less reduction in the fertility status of the soil. In case of cotton crop, it is of longer duration, the soils comparatively get exhausted more than that from soybean. The other advantage is the profitability. It was seen from various studies that the per hectare gross returns from soybean (₹ 24000) were higher than sorghum (₹ 12608) and cotton (₹ 15264) and also the net returns too (Farkade, 2008). No doubt, this picture might be due to continuance of same and stable prices for soybean as compared to relative crops over the years. However, in due course of time the prices of soybean or other alternative crops undergo a change in either direction i.e. increase or decrease. Therefore, it would have effect on change in acreages under these crops. But it was seen that there is a stability of soybean crop in recent years in Yavatmal district. Therefore, it was important to study that at present what is the picture of profitability, returns, etc. The present study would be helpful for framing suitable price policies and for planning and implementing different development programmes for soybean production programme in future, if required. Similarly, study would also focus on, what role the intermediaries are playing at the disposal of soybean and what improvements are needed in their functioning, so that producers can put to the advantage. Therefore, present study involving economics of production and marketing of soybean in Yavatmal district was taken up with following specific objectives.

1.7. Objectives of the Study

1. To estimate the cost of cultivation of soybean.
2. To study the resource use efficiency in soybean cultivation.
3. To estimate the marketing costs, price spread and marketing efficiency of soybean.
4. To study the problems in production and marketing of soybean.

1.8 Scope and Utility of the Study

Scope of this investigation limits itself to study the aspects mentioned in the objectives. Now-a-days there is an increased demand for edible oils due to increased population. Especially in case of soybean, the tastes, preferences, family consumption and speed of life are being forced to use processed products and healthy food as it is a high protein and low-calorie food. The Government is trying to encourage production and marketing activities of oilseed crops especially for soybean. Incentives and quick services have been given to producers and farmers of soybean.

The study entitled, “Economics of production and marketing of soybean in Yavatmal district of Maharashtra” will show the extent of profitability of the crop.

The information on production and marketing of soybean would have a way to a suitable strategy ensuring impetus and relief in the process of production and marketing of soybean in the area under study. The findings of the present study would be relevant and applicable to similar situations existing elsewhere. The study of items of market costs at different stages in the marketing process is extremely useful. The findings would be of great help to convince the farmers themselves about the tolerance of certain market sources such as packing, transportation, etc. in securing relatively better price in various markets. The findings will also depict the marketing channels and intermediaries involved in marketing of soybean in different markets. This would certainly help to follow a suitable channel ensuring better returns to the farmers.

The study would definitely be useful to the farmers in planning their marketing process of this oilseed crop in the area under study and also give guidelines to the extension workers and policy makers to evolve a better production and marketing system.

The findings of the study would help the planners and decision makers to adopt effective strategies for development and expansion of production and marketing process in other regions with similar conditions.

The conclusion drawn from this study would provide an indicative guideline for accelerating the soybean production.

The present study covers Yavatmal district, but it is hoped that the findings may be applicable to other soybean growing districts in Maharashtra, in general. The research findings would be highly useful to the farmers, agricultural economists and planning authorities of the state.

1.9 Limitations of the Study

Due to limitation of time and resources, the study was restricted to the analysis of data collected from 90 soybean farmers from 6 villages of 2 tahsils from Yavatmal districts of Maharashtra. The results of study are based on data collected for only one agriculture year that is 2018-19. Data collected by survey method. Farmers of the villages do not maintain farm records so responses of farmers regarding area sown, quantity of seed used, manures and fertilizers used, output produced, information and other related question were mainly based on memory and data related to Yavatmal district only. Findings though may not be generalized; it could become applicable in the areas where similar conditions exist.

2. REVIEW OF LITERATURE

While carrying out systematic research it is necessary to have knowledge of the previous research works carried out by other researchers. It gives an insight in respect of manner in which the problems have been tackled, the nature of results obtained and the conclusions derived. The review of past literature, therefore, forms an integral part of any systematic research work. Therefore, the literature closely related to the present study was reviewed in this chapter. The literature is grouped into following categories.

2.1 Cost of Cultivation.

2.2 Resource Use Efficiency.

2.3 Marketing cost, Price spread and Marketing efficiency.

2.4 Problems in Production and Marketing of Soybean.

2.1 Cost of Cultivation

Kamlekar (2002) studied the economics of production and marketing of soybean in Sangli district and worked out per hectare cost A as ₹ 6420 as against the estimated cost of ₹ 8036. The estimated cost was more and it might be due to use of recommended technology. The average per hectare cost A was observed ₹ 6479 in small size group of farmers and ₹ 7073 in large size group of farmers in Sangli district. The overall per hectare cost C worked out to ₹ 11491.65 as against the estimated cost of ₹ 13173.97. The average per hectare cost C was found to be the lowest in small size group (₹ 11453) and the highest in large size group (₹ 12265).

Kakade (2006) studied the economics of soybean seed production in Nagpur district of Maharashtra state. The result revealed that, average per hectare total cost i.e., cost C was worked out to ₹ 16172.72. The input-output ratio for soybean seed production at cost C was 1:1.20, which indicated that soybean seed production was profitable business.

Nale (2007) studied the economics of production and marketing of soybean in Satara district and concluded that, the per hectare use of human labour was 124.91-man days which comprised of 97.51-man days of hired human labour and 27.40man days of family human labour, requirement of seed for soybean was 66.00 kg. The per hectare cost of cultivation of soybean was worked out to ₹ 18357.93. It increased with increase in the use of holdings. It was found that, at the overall level, the yield and gross returns obtained were 18.43 quintals and ₹ 23391.46 per hectare, respectively.

Chavan (2008) studied economic analysis of semi medium farm in Marathwada region of Maharashtra. For the study, cross sectional data were selected for various crops from 100 sample farmers. Result revealed that, cost of production was ₹ 11750.53 per hectare whereas,

expenditure incurred on cost-A was ₹ 8032.50 (68.36 per cent) and cost-B was ₹ 10586.53 (90.09 per cent). Amongst the various items of expenditure in cultivation of soybean, the highest cost was ₹ 2057.72 on bullock labour (17.51 per cent) and rental value of land ₹ 2408.75 (20.50 per cent). It was seen that the main produce and by produce were 12.06 and 9.88 quintals per hectare, respectively. The output input ratio was 1.24 which was indicated that, soybean cultivation was profitable enterprise.

Asmatoddin *et. al.* (2009) undertaken a study on study economic analysis of pulses of medium farms in Marathwada region of Maharashtra. The study of economic analysis of pulse crops *viz.*, soybean, green gram and pigeon pea was undertaken from medium farm during agriculture year 2005-06 in Marathwada region of Maharashtra. The data were taken from cost of cultivation scheme MKV, Parbhani. The sample of 100 medium farm size farmers throughout zone was selected. Data were tabulated and analysed from appropriate statistical tools. The result revealed that, in case of soybean production process rental value of land (23.27 per cent), bullock labour (15.80 per cent), seed (12.88 per cent), hired human labour (12.00 per cent) and family human labour (9.64 per cent) were the major items of cost. Per hectare cost of cultivation i.e. cost-C was ₹ l1355.60 and net profit was ₹ 4761.86.

Pokharkar *et. al.* (2011) conducted a study on economics of production and marketing of oilseed crops in Western Maharashtra and worked out the per hectare cost of cultivation of soybean, it was estimated to ₹ 20726.98 whereas, working capital and Cost A constitutes 66.90 per cent (₹ 13866.72) and 72.44 per cent (₹ 15015.16), respectively. The Major item of cost of cultivation were total human labour (20.91 per cent) and was followed by machine labour (17.83 per cent), rental value of land (16.96 per cent). The gross return received from soybean was ₹ 21295.59. The per hectare profit at Cost A, Cost B and cost C was ₹ 6280.53, ₹ 2574.37 and ₹ 568.61, respectively. The B:C ratio of soybean was 1.03. It clearly indicates that, soybean crop was slightly profitable.

Jawane (2012) studied the economics of production and marketing of soybean in Western Maharashtra and concluded that, the average per hectare hired human labour was 61.86 man days and family human labour used was 36.92 man days, while bullock labour was 5.24 pair days, seed rate used was 73.36 kg and use of N, P, and K was 40.95, 32.65 and 7.44 kg, respectively. The average per hectare cost A, B and C were ₹ 19177, ₹ 25650 and ₹ 30555, respectively. The average productivity was to the extent of 23.02 quintals. The input -output ratio at cost C indicated that, the soybean cultivation is profitable enterprise due to high productivity of soybean.

Agarwal and Singh (2014) studied economic analysis of soybean cultivation in Narsinghpur district of Madhya Pradesh. The average cost of cultivation was observed highest on medium farm as compared to large and small farmers. Average per hectare gross return from

soybean for overall farmers was found to be ₹ 43179.59. Per quintal cost of production of soybean was ₹ 1354.92 on overall farms. The benefit cost ratio was similar in case of medium and large farmers with 1.74 and slightly higher in case of small farmers 1.76.

Agarwal and Singh (2015) analysed to estimate the cost and return structure and resource use efficiency of soybean cultivation in Madhya Pradesh. The average cost of cultivation was observed ₹ 25454.66 on overall farms and it was highest on small farm followed by medium and large farms, respectively. An average per hectare gross return from soybean was observed highest on large farm compared to small and medium farms. At overall level, the per quintal cost of production of soybean was ₹ 1397.28. The benefit-cost ratio was the lowest in case of small and highest in case of large farmers.

Perke *et. al.* (2017) conducted study on economics of soybean production in Hingoli district of Maharashtra, and found that, per hectare total cost with regards to soybean was ₹ 35262.14 while cost-A was ₹ 23036.28 and cost-B was ₹ 31672.14. Per cent share of cost-A was 65.32 per cent while cost-B was 89.81 per cent. It was observed that, gross return was high on soybean farm ₹ 51620.00. It was clear that, farm business income, family labour income and net profit were ₹ 28583.72, ₹ 19947.86 and ₹ 16357.86 for soybean farm, respectively. Per quintal cost of production was higher as ₹ 2364.03. The output-input ratio was 1.46 indicating that, soybean is highly profitable enterprise.

Mohod *et. al.* (2018) studied economics of soybean crop in Western Vidarbha region of Maharashtra State, and concluded that, the average per hectare hired human labour was 52.70 man days and family human labour used was 13.52 man days, while bullock labour was 5.90 pair days, seed rate used was 72.31 kg and use of N, P, K was 85.71, 132.51 and 6.77 kg, respectively. The average per hectare operating cost, C2 and C3 were ₹ 23502.99, ₹ 27175.53 and ₹ 29893.08, respectively. The average productivity was to the extent of 14.84 quintals. The input -output ratio at cost C indicated that, the soybean cultivation is profitable enterprise.

Nannaware *et. al.* (2018) undertaken study in Wardha district of Vidarbha region, entitled with economics of production of soybean in Wardha district and concluded that, per hectare cost of cultivation of low adopter at cost A, B and C were ₹ 17255.11, ₹ 27490.89 and ₹ 29305.39, respectively. Per hectare cost of cultivation of medium adopter at cost A, cost B and cost C were ₹ 19220.63, ₹ 26886.20 and ₹ 27918.44, respectively. Per hectare cost of cultivation of high adopter at cost A, cost B and cost C were ₹ 21505.82, ₹ 31398.44 and ₹ 32061.48, respectively. Per hectare cost of cultivation at overall level, cost A, cost B and cost C were ₹ 19327.14, ₹ 28591.79 and ₹ 29761.71, respectively. At overall level the B:C ratio at cost C was 1:1.48.

To summarize, the above reviews indicated that, the per hectare cost of production of soybean has been increased over the years from ₹ 11491.65 to ₹ 35262.14 and the B:C ratio has

been fluctuated between 1.03 to 1.76, soybean production is viable proposition but its economic viability varied across the regions, size of farms and over the time span. Hence the present aspect has been considered for the present study.

2.2 Resource Use efficiency

Ramaswamy and Selvaraj (2002) estimated the growth rate of area, production and yield of pulses, oilseed and coarse cereals like jowar and bajra and concluded that, the productivity increase of coarse cereal was not substantial as in case of superior cereals, coarse cereals like jowar and bajra had recorded negative growth rate in respect of area for the period from 1970-71 to 1999-2000.

Marwar et. *al.* (2004) examined the performance of oilseeds in different districts of Vidarbha for the period from 1980-81 to 2001-02. The study revealed that, the area under *kharif* groundnut decreased over the period under study in Vidarbha, whereas summer groundnut showed mixed trends. The area under sunflower and soybean had increased significantly in all the districts of Vidarbha. In general, the area under total oilseeds had increased significantly. The production of sunflower, summer groundnut, safflower and soybean increased significantly. The productivity of kharif groundnut and soybean had increased and productivity of sunflower was more or less stagnant over the study period. The productivity of safflower decreased at a rate of 1.80 per cent in Vidarbha, during the period under study.

Nale (2007) studied economics of production and resource use productivity of soybean production in Satara district, the results of the study revealed that bollock labour, were over utilised and human labour, machine labour, seed and manure were underutilised by the farmers. Hence there is scope for increasing these resources.

Farkade (2008) studied the economic analysis of production, marketing and processing of soybean in Vidarbha region of Maharashtra state. This study was conducted to examine the area, production and productivity performance of soybean along with marketing and processing. The area, production and productivity of soybean in Vidarbha region increased at the rate of 12.41, 18.95 and 3.27 per annum, respectively during the period from 1987 to 2005. In all selected districts, higher growth rates of all the three variables *viz*., area, production and productivity of soybean in a given period of time were noticed except in Nagpur.

Jawane (2012) conducted study on economics of production and marketing of soybean in Western Maharashtra. The findings of the investigation showed that, the area, production and productivity of soybean in Western Maharashtra region had been increased at the rate of 28.01, 32.62 and 9.41 per cent per annum, respectively during overall period of 25 years i.e. 1985 to 2010. In both selected districts, higher growth rates of all the three variables *viz.*, area, production and productivity of soybean in a given period of time were noticed. The higher growth

rates in production were partly due to increase in area and partly due to increase in productivity of soybean in Western Maharashtra.

Mugabo *et. al.* (2014) studied resource use efficiency in soybean production in Kamony district of Southern province, Rwanda. Results indicated that, with an elasticity of 0.46, plot size was the most important factor of soybean production. It was closely followed by intermediate inputs (fertilizers, pesticides and seeds), with a coefficient of 0.44. When intermediate inputs were decomposed, fertilizers with an elasticity of 0.062 appears to contribute more to soybean production than pesticides (0.057) and seeds (0.034). Technical inefficiency was responsible for at least 93 per cent of total variation in soybean output among the survey farmers. The relative efficiency (allocative efficiency) of resource use, expressed as the ratio of marginal value product (MVP) to marginal factor cost (MFC), were 1.73 for soybean plot size, 1.36 for fertilizers, and 1.92 for pesticides. These indicate that, too little of these inputs are being used in relation to the prevailing market conditions.

Datarkar *et. al*. (2015) examined the resource use productivity and resource use efficiency of Maharashtra and results revealed that, regression coefficients of human labour (0.083) and irrigation (0.023) were positive and significant at 10 per cent level of significance. Similarly, regression coefficients of manures (0.016) and Technology Adoption Index (0.112) were positive and significant at 1 per cent level of significance. It could be inferred that, if one per cent increased in use of human labour, irrigation, manures and Technology Adoption Index, it would lead to increase the soybean production by 0.083, 0.023, 0.016 and 0.112 per cent, respectively. Thus, it implied that, there was scope to increase these resources in soybean production. The value of coefficient of multiple determination (R^2) was turned out to 0.65. The ratios of MVP to MC for soybean in case of human labour were found to be (1.11), for manure (1.80) and for irrigation (8.20) which was greater than unity. These ratios indicated that, too little of these inputs are being used in relation to the prevailing market conditions. Hence, the farmers are seeming to be inefficient in allocating crucial inputs *viz.*, human labour, manure and irrigation. This implies that, there are ample opportunities for the farmers to increase production by allocating these inputs and using them efficiently.

Srivastava *et. al.* (2015) studied economics of production and resource use efficiency of soybean production in India, the results of the study revealed that, human labour, machine labour, were over utilised and seed, manure, chemical fertilizer, bullock labour and plant protection chemicals were underutilised by the farmers. The MVP to MFC ratio for human labour (-3.13), machine labour (-0.007), were less than 1 hence, these resources in study area were over utilized and seed (3.83), FYM (1.57), chemical fertilizer (8.90) and bullock labour (2.55) and PP chemicals (3.80) were showing more than one. Hence these resources were underutilized hence there is scope for increasing these resources.

Upev *et. al*. (2016) analysed the resource use efficiency among soybean farmers in Gboko local Government area of Benue state, Nigeria. The result of the production function analysis indicated that, 87.21per cent of the variation in the output of soybean is explained for by the independent variables. Resource-use efficiency revealed that, quantity of seed, farm size, herbicide and inorganic fertilizer were underutilized while labour was over utilized. Provision of adequate and timely farming inputs, making loans accessible to farmers and reasonable market price of soybean are essential to boost production.

Naik *et. al*. (2018) studied resource use efficiency of soybean in Belagavi district of Karnataka. The results of the study revealed that, seed, FYM, human labour, bullock labour, and fertilizer were over utilised and machine labour and plant protection chemicals were underutilised by the farmers. The MVP to MFC ratio for seed (-0.59), FYM (0.27), human labour (0.13), bullock labour (-0.23), fertilizer (0.05) were less than 1 hence these resources in study area were over utilized and machine labour (3.60) and PP chemicals (2.21) were showing more than one. Hence, these resources are underutilized and there is scope for increasing these resources.

To conclude, the above reviews indicated that, the resources such as bullock labour, seed, manure, fertilizers, irrigation, plant protection chemicals and technology adoption index were the major determinants of production efficiency of soybean cultivation, but it was varied across the regions, locality and over the time period which needs to be verified for the study area. Hence, the present objective has been considered for the present study.

2.3 Marketing cost, Price spread and Marketing efficiency

Athavale (2002) studied marketing and processing of soybean in Indore district of Madhya Pradesh. Season wise mandi data showed that, 74.20 per cent arrivals took place during harvest season. During post-harvest season arrivals reduced to 15.22 per cent. The lowest price was observed in September and October. The maximum price was reached in the months of July and August. On the selected farms soybean and gram were mainly for sale, whereas, jowar and wheat were produced for home consumption. The total quantity of soybean sold 79.92 per cent sold within the villages. No significant relationship was noticed between the proportions sold to different agencies and size of holdings. Oil federation played an important role in procuring soybean. Soybean was processed in oil mills. The products obtained were oil and deoiled cakes. All effort should be made to organize marketing and processing cooperatives so that the average farmer is benefited.

Kamlekar (2002) studied the economics of production and marketing of soybean in Sangli district of Maharashtra. The overall per quintal costs incurred on marketing were ₹ 31.90, ₹ 31.83 and ₹ 39.80 in small, medium and large size groups respectively. The cost on octroi was ₹ 2.00 (6.27 per cent) at overall farmers. Commission was found to be the highest in the total cost. It was ₹ 18.86 per quintal constituting 59.12 per cent of the total cost of marketing at overall level.

Banafar *et. al.* (2003) examined the marketing of soybean in Sehore district of Madhya Pradesh. They found three marketing channels as, Channel I: Producer-Village merchant Wholesale Dealer-Processor-Refiners-Wholesale dealer of oil-Retailer of oil-Consumer. Channel II: Producer-Cooperative Society-Processor-Refiners Wholesale dealer of soybean oil-Retailer of oil-Consumer. Channel III: Producer-Wholesale dealer in regulated market-Processor-Refiners-Wholesale dealer of oil-Retailer of oil-Consumer. The study also revealed that, the per quintal marketing costs for Channel I, II and III was ₹ 202.00, ₹ 160.40 and ₹ 191.27, respectively.

Pande *et. al.* (2005) undertaken the study on different aspects of soybean marketing. The present study was conducted in Indore district of Madhya Pradesh. It was evident from study that, the common marketing channels were like Channel-1 (producer-oil miller-consumer), Channel-2 (producer-primary market-secondary market-oil miller- consumer), Channel-3 (producer-secondary market-oil miller-consumer), Channel-4 (producer-co-operative societies (oil miller) -consumer), Channel-5 (producer-National Agricultural Marketing Federation (NAFED) - oil miller- consumer). Many marketing agencies involved in soybean marketing were farmer, middleman viz. (village traders), secondary traders (wholesale traders), and facultative middleman (Hamal, Transporters).

Wankhade *et. al.* (2010) studied marketing of soybean in Amravati district of Maharashtra. One most important marketing channel was identified in the Amravati market i.e. Producer –Wholesaler –Processor –Retailer –Consumer. The comparison between costs incurred by different market intermediaries in the marketing channel shows that retailer incurred lowest cost. It was also observed that, the producers share in consumer price was 72.30 per cent. Farmers always desire to get reasonable price for their farm product. Consequently, for profitable transactions a careful planning of marketing of soybean is must. For this purpose, present study has been done.

Farkade *et. al*. (2011) carried out study on economic analysis of production and marketing of soybean in Vidarbha region of Maharashtra. She observed that, the total marketing charges paid by producer, village trader, processor, wholesaler and retailer in the marketing of soybean were ₹ 34.2, ₹ 36.80, ₹ 153, ₹ 37 and ₹ 31 per quintal in Channel I, respectively. Marketing charges paid by the producer, wholesaler, processor, wholesaler and retailer in the marketing of soybean were ₹ 54.00, ₹ 32.00, ₹ 148, ₹ 40 and ₹ 35 per quintal in Channel-II, respectively. Marketing charges paid by the producer, wholesaler, processor, wholesaler and retailer in the marketing of soybean were ₹ 42.41, Rs.30.00, ₹ 151, ₹ 59 and ₹ 30 per quintal in Channel III, respectively. The producer's share in consumer's rupee was the highest in Channel-II (34.35 per cent) followed by Channel-ITT (33.74 per cent) and Channel-I

Patel *et. al.* (2012) evaluated the price spread and marketing of mustard in Banaskantha district of Gujarat state and revealed that, in marketing of mustard crop, the

producer's net receipt was ₹ l592.55 per quintal in Palanpur market, which was equivalent to 87.54 per cent of consumer's price. The total marketing costs incurred by the producer was ₹ 32.45. i.e. 1.78 per cent of consumer's price. The wholesalers enjoyed the margin of ₹ 62.63 per quintal (3.44 %) of the consumer's price and his total marketing cost was ₹ 45.62 per q (2.51 %) of consumer's price.

Chavhal *et. al*. (2014) assessed the marketing cost, marketing margin and price spread in soybean. The study was conducted in the Parbhani market for surveying of 30 market intermediaries. Three marketing channels were noticed in sale of soybean *viz.,* Producer-Village Merchant-Wholesaler- Oil processor (Channel-I), Producer-Wholesaler- Oil processor (Channel-II), Producer- Oil processor (Channel-III). It was observed that, per quintal marketing cost was higher in Channel-I i.e. ₹ 169.69 followed by ₹ 138.65 in Channel-II and ₹ 38.80 in Channel-III, respectively. Producer's share in consumer's rupee was maximum in Channel-III (98.93 %) while minimum in Channel-I (83.14 %).

Singh (2014) evaluated economic performance of different marketing channels of soybean in Madhya Pradesh. In his study he studied four channels, Channel I: Producer -Village merchant- Wholesalers (Krishi Upaj Mandi) -Processor or agent (oil), Channel II: Producers -Processors or agent (oil), Channel III: Producers -I.T.C. (choupal)- Processors or agent (oil), Channel IV: Producer- Wholesalers (Krishi Upaj Mandi) -Processors or agent (oil). The data revealed that, among all these channels on an average the producer received maximum price (net amount) sale through processor (₹ 2701 /q.) followed by sale through wholesaler (₹ 2665 /q.), ITC choupal (₹ 2656 /q.) and sale through village merchant (₹ 2589 /q.), respectively. The study revealed that, when soybean was sold through Channel IInd (sale through processor) it has been found no involvement of market functionaries and agent of processors was dealing on the behalf of processor. Hence, the marketing cost and margin was found to be lowest ₹ 76 per quintal (processor cost + agent brokerage). The highest marketing cost and margin was observed ₹ 188 per quintal in case of Channel Ist (sale through village merchant). In this case number of middlemen involved hence, marketing cost was incurred at different stages of disposal. It reveals that, in case of Channel IIIrd (sale through ITC) the marketing cost and margin was found to ₹ 121 per quintal while, Channel IVth (sale through mandi) the marketing cost and margin found to ₹ 112 per quintal.

Solanki *et. al.* (2014) studied economics of soybean cultivation and its marketing pattern in Malva plateau of Madhya Pradesh, results showed that, total cost increased with the increase in the farm size. The total cost and its component in large farmers were relatively higher than those in medium and small farmers. The net return was found higher for large farmers followed by medium and small farmers since large farmers used more resources in production process. In the marketing of soybean middleman's margin was highest in Channel III followed by Channel IV, II and I. The producers share in consumers rupee was highest in Channel I (73.17 per

cent) followed by Channel IV. II and III. The marketing Channels II and III were complicated involving a number of middlemen and market functionaries between the producer and consumer as compared to Channels I and IV. The marketing efficiency was highest in Channel I followed by Channel IV, II and III. In this channel a large number of intermediaries were involved resulting in higher marketing cost and lower market efficiency. Study concluded that, there was immense scope for soybean processing industry which should be promoted in order to generate gainful income and employment in the study area.

To conclude, the above reviews indicated that, in soybean production near about 95 per cent of the total produce was the marketable surplus and 2-4 marketing channels were involved in the marketing of soybean. The per quintal cost of marketing varied from ₹ 31.83 to ₹ 188 and the producers share in consumer rupees varied between 72.30 to 98.93 per cent. The producers share in consumer rupees and efficiency of marketing channel depends on the distance of marketing, number of intermediaries involved, type of produce sold, locality and time of marketing etc. which needs to be studied frequently and hence the particular aspect of the study has been attempted.

2.4 Problem in Production and Marketing of soybean Farmers

Lokhande (2003) studied economics of production and marketing of soybean in Bhandara district and found the problems regarding the soybean cultivation and marketing of soybean. Difficulty of cash for effecting payment of the labour, difficulty in getting human and bullock labour for timely farm operations, non-availability of loan in time for carrying out implements, quality seeds, fertilizer were the major problems.

Banafar *et. al.* (2004) investigated constraints in soybean production, marketing and processing in Sehore district of Madhya Pradesh. Depending upon the climatic conditions the soybean production has been fluctuating for more than two decades. The non-availability of high-yielding, disease-resistant varieties is another constraint, the other cause for the low yield of soybean is that of poor management practices. However, the development programmes of the Government of Madhya Pradesh are slowly changing the outlook of the farmers to adopt better management practices. The major causes for low production of soybean in the study area are lack of appropriate soybean production and post-harvest technologies the basic research and socio-economic constraints along with non-availability of quality seed in the required quantity. The following suggestion could be considered for increasing the production. 1) Development of high yielding varieties. 2) Improvement in the plant type. 3) Evaluation of varieties which may give better and stable yields under rainfed/restricted irrigation condition. 4) Development of disease resistant varieties. 5) To convince the farmers of the benefit of adoption of improved technology available large-scale demonstration should be undertaken in all the important soybean growing

areas. 6) Adequate training programme of the field workers at all the levels may be conducted so as to transfer the existing production technology.

Khan (2007) examined the problems in production of soybean. The study was conducted on 50 farmers of Narsing Kheda village of Sihore district with the objective to know the major constraints. Severe constraints like unavailability of electricity, higher input cost, limited source of information and unavailability of insecticides pesticides and fertilizers increase the cost of cultivation and check their income. The socio-personal attributes like age, land holding and economic motivation had positive and significant correlation, while education, scientific orientation and risk preference had negative and significant correlation.

Nale (2007) investigated problems in production and marketing of soybean in Satara district and concluded that, high commission charges, high octroi charges, no timely payment, low price paid to the produce and lack of intelligence were the main problems faced by the soybean Farmers in the tract under study.

Raghuwanshi *et. al*. (2007) conducted study for price spread and constrains of marketing of soybean in Sehore district of Madhya Pradesh. The study revealed that, main constrains of producers are higher transportation rate faced by 97 per cent of total farmers. Lack of fanners organization is faced by 94 per cent producers, low prices of peak period faced by 92 per cent, 76 per cent farmers complained about market located at distant place, 75 per cent faced the problem lack of information about the ware houses facilities, 24 per cent farmer complained inadequate facilities in market, 23 per cent of producers complained about improper weighing in the market.

Farkade (2008) studied economic analysis of production, marketing and processing of soybean in Vidarbha region. The study provided guidelines and direction for proper use of resource for maximization of profits. The study was useful in selecting an appropriate cropping system for the study area. When the soybean crop had entered into existing cropping pattern of the producers in Vidarbha by replacing *kharif* sorghum at certain places while cotton at other places it is certain that it is relatively profitable. So, the present study will focus on, what are the problems faced by the farmers during production and marketing of soybean.

Singh *et. al*. (2011) the study was undertaken in Sonkutch block of Dewas district of Madhya Pradesh, with object of problems and suggestion in economics of production and marketing of soybean. Farmers in study area faced some problem they were, instability and fluctuation in prices of agricultural produce which ultimately affects net income of farmers. Problem of transportation of agricultural produce was found severely. Lack of marketing intelligence among the fanners have been identified, method of selling of agricultural produce through auction was not appropriate and Mandi staff charges extra amount from the farmers.

Tawale and Pawar (2011) studied constraints and suggestions of soybean production in Maharashtra, the study revealed that, constraints like attack of insect pests and diseases was expressed by 74.45 per cent of soybean farmers. In next order, shortage of labour at time of harvesting (62.78 per cent), and low price of soybean at the time of harvesting (61.11 per cent) were major constraints by the soybean farmers. In regard to suggestions, provision of training in regard to pest and disease controls was suggested by 61.11 per cent, followed by provision of high rate for soybean was suggested by 53.89 per cent farmers.

Singh *et. al.* (2012) examined the constraints in adoption of soybean production technology the study revealed that, the constraints related with personal matter, farmers reported that lack of education (67.72%) and lacks of knowledge (54.05%) were the major constraint. Problem of non-availability of credit at proper time and non-availability of proper amount in credit were important socio-economic constraints. The study also indicated that, the lack of social participation and lack of risk bearing capacity were major socio-psychological constraint. As far as the communicational constraints were concerned, lack of information at proper amount was found a major constraint followed lack of information in proper time and non-availability of information media. The study also showed the technological constraints due to which the rate of adoption was low. It was observed about 91.72 per cent respondents reported the lack of irrigation facility as the major constraints. Following suggestions could be considered to overcome these constraints- to provide the irrigation facility. Extension agency should work properly, credit facility should provide at proper time and most require input should be supplied at proper time.

Deshmukh and Deshmukh (2013) studied constraints in production and marketing of soybean, the present study was undertaken in Morshi tahsil of Amravati district in Vidarbha region. The aim was to study constraints in production and marketing of soybean using primary data which was collected by personal interview method. According to constraints level 25.33 per cent showed high constraint level. In rank of situational constraints, first rank was given to non-availability of labour in time. In case of knowledge and information constraints, first rank was given to lack of knowledge about seed treatment and in communication constraints lack of contact with extension agencies ranked first in economic constraints, first rank was given to high cost of manures and fertilizers and in production constraints first rank was given to lack of processing plant in the area. Regarding suggestion 100 per cent of the respondents suggested a need of co-operative processing plant in the area and refresher training before season by 99.33 per cent of the respondent.

Ahikwar *et al.* (2014) conducted study on economics of soybean cultivation and analysis of production constraints in central Narmada valley of Madhya Pradesh, 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 per cent of farmers, missing 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%), missing awareness on intercropping techniques (51%) and deficit in knowledge on recommended production practices (49%) were the other major constraints reported by the soybean Farmers in the study area. Most of the farmers of all farm size categories experienced these constraints, but frequency was higher on smaller farm holdings than large holdings.

To summarize, the above reviews indicated that, the constraints such as incidence of pests and diseases, high price of plant protection chemicals, high price of seed, non-availability of labour, high wage rates, irregular supply of electricity, natural disaster, decreasing soil quality, lack of credit facilities and inadequate supply of fertilizers were the major constraints faced by the farmers in soybean production, whereas the fluctuations in disposal price of soybean was one of the major marketing constraints faced by farmers. But it was varied across the regions, locality and over the time period which needs to be identified for the study area. Therefore, the specific objective has been considered for the present investigation.

Though, the above-mentioned studies indicated the production and marketing of soybean, but no studies were carried out on these aspects for Yavatmal district. So, the present study was undertaken for Yavatmal district. Most of the research workers had mentioned that the commission charges were most expensive item of marketing cost. Also, they observed that the intermediaries involved in marketing of soybean were itinerant traders, commission agents, wholesalers and oil mill owners. Through, the present investigation, it will be ascertained that whether similar intermediaries do exist or any other agencies are present in the marketing of soybean.

3. METHODOLOGY AND SOCIO-ECONOMIC FEATURE OF STUDY AREA

(A) METHODOLOGY

The present study was undertaken with the aim to study the economics of production and marketing of soybean in Yavatmal district of Maharashtra. The object of any scientific investigation is to draw the useful conclusions in the light of objectives of the study. In order to arrive at the meaningful conclusions, it is essential for the investigator to adopt appropriate method and procedure. Keeping this in view, this chapter has been devoted to explain the methodology adopted, to fulfil the objectives of the study.

3.A.1 Sampling Design

Since the study is aimed at finding out the economics of production and marketing of soybean, the sampling design adopted for the investigation was simple randomization.

3.A.2 Selection of District

The Yavatmal district was purposively selected on maximum area under soybean cultivation for the present study. The primary data of soybean were collected from farmers and the market intermediaries. The data of marketing related aspects was obtained from commission agents, wholesalers and retailers.

3.A.3 Selection of Tahsils

Two tahsils (Darwha and Digras) from Yavatmal district were purposively selected on the basis of maximum area under soybean for the study.

3.A.4 Selection of Villages

Based on availability of samples, three villages from each tahsil were purposively selected. Among each village 15 sample farmers growing soybean were selected randomly. The details are given in table 3.1.

Table 3.1 Distribution of Selected Soybean Farmers in Different Groups

Tahsil	Village	Size Group			Total
		Small	Medium	Large	
Darwha	Ladkhed	5	5	5	15
	Rajura	5	5	5	15
	Khopadi	5	5	5	15
Digras	Aarambhi	5	5	5	15
	Sakhara	5	5	5	15
	Vitholi	5	5	5	15
Total		**30**	**30**	**30**	**90**

3.A.5 Selection of Farmers

For selection of the sample farmers, a list of soybean farmers along with their operational area for each of the selected villages was prepared on the basis of information obtained from village revenue office. The farmers were then arranged in descending order of their operational area for each of the selected villages and five farmers for each of the three predetermined size classes (i.e. area under soybean) *viz.,* group I (0.01 to 0.40 ha), Group II (0.41 to 0.80 ha) and Group III (0.81 ha and above) thereby making a total of 15 farmers for each village were selected randomly. Thus, the total sample for the study was consists of 90 farmers comprising 30 each for different size classes (Table 3.1).

3.A.6 Collection of Data

The data were collected by survey method by conducting personal interviews of sample farmers with the help of schedule prepared for study purpose. Data were collected regarding the aspects like land use pattern, cropping pattern, input utilization and yield for soybean crop during the year 2018-2019. The information pertaining to marketing of soybean *viz.* marketing cost, price realized and marketing channel followed was collected from soybean farmers and market functionaries.

3.A.7 Cost Concepts and Evaluation of Items of Cost

For estimating the cost of cultivation of soybean following standard cost concept *viz.,* Cost 'A', Cost 'B' and Cost 'C' were used.

3.A.7.1 Cost 'A'

It includes the cost on account of human labour, total bullock pair charges, total machinery power charges, cost of seed, cost of manures and fertilizers, insecticides and pesticides, irrigation charges, depreciation on implements and farm buildings, land revenues, cesses and other taxes as well as interest on working capital, incidental charges, etc.

A. Human labour

It includes both hired and family labour. Most of the labour force engaged in soybean production was hired. However, the farmers have to engage his own family members from time to time for certain operations like spraying, weeding, etc. throughout the year. Human labour cost comprises of -

a. Wages actually paid to hired labour

b. Imputed value of labour put in by the family members

c. Wages paid to attach farm labours for different operations have been included in the hired labour. The actual wages paid to the casual labour were considered and wages of male and female members of the family members were calculated on the basis of existing wage rates of the hired casual labours in force from time to time for different operations.

B. Bullock pair charges

Bullock pair cost was calculated by considering the actual hired charges paid by the farmers or the prevailing rates for bullock pairs for different operations were taken it to consideration.

C. Machine power

In case of owned machines, cost was evaluated on the basis of hired charges prevailed in the village and in the case of hired machines as per the actual amount paid.

D. Seed

In case of the seed purchased from the other farmers or from shop, the actual price paid was ascertained and charged.

E. Manure

The cost of farm yard manure (FYM) or compost produced on the farm was evaluated at the rates prevailed in the village. The cost on account of manures purchased was accounted as the actual price paid by the farmers

F. Fertilizers

The fertilizer was evaluated at the actual price paid by farmers.

G. Insecticides and pesticides

The insecticides and pesticides expenses were considered at the actual price paid by the farmers.

H. Irrigation charges

Irrigation was through well and lift. In case of lift irrigation, the actual irrigation charges paid by the farmers were taken into account. The amount spent on the maintenance of electric motor for irrigating the crop, the depreciation and the hours of electric motor use were considered for estimating the irrigation charges in case of well irrigation. The details regarding the estimation of irrigation charges is given below.

$$\text{Irrigation Charges} = \left(\frac{\text{Depreciation on irrigation structure} + \text{Interest on fixed capital}}{\text{Irrigated gross cropped area}} \right) \times \text{Plot area} + \left(\text{Irrigation hours} \times \text{per hour machine maintenance cost} \right)$$

I. Land revenues, cesses and taxes

This cost included land revenue and other relevant taxes and cesses which were actually paid by the farmers.

J. Depreciation on implements, machinery and farm buildings

Farm assets like implements and farm buildings were evaluated at the prevailing market prices taking into consideration the condition of the assets. Depreciation of these assets for the current year was calculated using straight line method for which the present value and the remaining useful life of asset was considered.

$$\text{Annual depreciation} = \frac{\text{Present value} - 10 \text{ per cent of present value}}{\text{Expected remaining life of assets}}$$

K. Interest on working capital

Interest on working capital was charged at the rate of 6 per cent per annum. Working capital includes cash or kind expenses incurred during the period of cultivation.

L. Interest on fixed capital

Interest on present value of fixed assets such as farm building, implements and machinery, irrigation structure and equipment's and livestock was charged at the rate of 10 per cent.

M. Rental value of land

This cost includes the estimated rental value of owned land. It was evaluated at the rate of 1/6 of the value of gross output minus the land revenue.

3.A.7.2 Cost 'B'

Rental value of land and interest on fixed capital represent imputed cost which is added to the Cost 'A'.

Cost 'B' = Cost 'A'+ Rental value of land + Interest on fixed capital.

3.A.7.3 Cost 'C'

It is the total cost of production, which included all the costs items, actual as well as imputed. The value of owned labours is imputed and added to cost 'B' to work out cost 'C'.

Cost 'C' = Cost 'B' + Imputed value of family labour.

3.A.8 Analysis of Data

The data collected from the sample farmers and other market intermediaries from selected tahsils were analyzed to obtain estimates of the production and marketing cost, etc. of the soybean.

The standard cost concept *viz.;* Cost 'A', Cost 'B' and Cost 'C' was used. The simple statistical tools *viz*; percentages, averages were used.

3.A.8.1 To Estimate the Resource Use Productivity

Cobb-Douglas production function of the following type was used.

$$Y = a\ X_1^{b1}\ X_2^{b2}\ X_3^{b3}\ X_4^{b4} X_5^{b5} X_6^{b6} X_7^{b7} X_8^{b8}\ X_9^{b9} + e^u$$

Where,

Y = Dependent variable (Output in q)

X_1 = Human Labour (man days)

X_2 = Bullock Labour (pair days)

X_3 = Machine power (hrs)

X_4 = Seed (Kg/ha)

X_5 = Manure (q)

X_6 = N (kg)

X_7 = P (kg)

X_8 = K (Kg)

X_9 = Plant Protection charges (₹)

bi's = Regression Coefficients

a = Constant

e^u = Error term

3.A.8.2 To Estimate the Resource Use Efficiency

The following formula was used.

$$MVP = (bi\ \frac{\bar{Y}}{\bar{X}i}\ )\ Py$$

Where,

bi = Production elasticity corresponding to the i^{th} input

$\bar{Y}$ = Geometric mean of output

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

Py = Price per unit of output

3.A.8.3 Total Marketing Cost

The following formulae of marketing cost was used.

$$\mathbf{C = C_f + Cm_1 + Cm_2 + \ldots\ldots + Cm_n}$$

Where,

C = Total Marketing cost

C_f = Cost paid by the producer from the time the produce leaves the farm till he sells it

Cm_i = Cost incurred by i^{th} middleman in the process of buying and selling the product

i = 1,2……n

3.A.8.4 Marketing Margin

$$MT=\sum (Si-Pi)/Qi$$

Where,

MT = Total marketing margin.

Si = Sell value of a product paid by i^{th} firm.

Pi = Purchase value of a product paid by i^{th} firm.

Qi = Quantity of product handled by i^{th} firm.

3.A.8.5 Price Spread

Price spread = Processors' price – price received by farmer

$$P_S= C_P – F_P$$

Where,

C_p = Processors' price

F_P = Price received by farmer

3.A.8.6 Marketing Efficiency

The marketing efficiency was calculated by using the modified method as suggested by Acharya and Agarwal (1999).

$$MME = RP / (MC+ MM)$$

Where,

MME = Modified measure of marketing efficiency.

RP = Net price received by farmer.

MC = Total marketing cost.

MM = Net marketing margin.

3.A.8.7 Marketing Channels

Cannel-I: Producer-Village Merchant-Wholesaler- Processor.

Channel-II: Producer-Commission Agent-Wholesaler- Processor.

Channel-III: Producer- Wholesaler - Processor

3.A.9 Problems in Production and Marketing

To find out the most significant factor which influences the respondents, Garretts Ranking Technique was used. As per this method, respondent have been asked to assign the rank for all factors and the outcome of such ranking have been converted into score value with the help of following formula,

Per cent position= $100-(R_{ij}-0.5)/N_j$

Where,

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = No of variables ranked by j^{th} respondents

(B) SOCIO-ECONOMIC FEATURES OF THE STUDY AREA

3.B.1 General

Yavatmal is known as white gold city, because of highest area and production of cotton crop. It is biggest district in Amravati division and sixth in Maharashtra.

3.B.2 Location

Yavatmal district is situated at the western part of Vidarbha region of Maharashtra state of India. Specifically, district lies between $19^0$26 North to $20^0$42 North Latitudes and $77^0$18 East to $79^0$98 East Longitude.

3.B.3 Boundaries

The boundaries of Yavatmal district are adjacent to Chandrapur on east, Washim on west, Amravati on north and Nanded on south.

3.B.4 Topography

Yavatmal district is surrounded by Ajanta hill range in east and north. Wardha river have divided the Wardha and Chandrapur district from Yavatmal in east and Penganga have divided Nanded in South. The central part of district has hill range with height of 350-500 m.

3.B.5 Climate

The climate of the district can be divided into three seasons as: a) Moderately warm-wet season during June to September, b) Cool dry season from October to February, and c) Hot dry season from March to May. The average temperature of the district ranges from 20^0C during winter to 45^0C during summer.

3.B.6 Soil

The soils of the district are black with considerable variation in texture and depth. They are light, medium and heavy soils. The soils along the river banks especially in Pusad, Mahagaon,

Darwha, Kalamb and Babhulgaon blocks are deep black and quite fertile. The soils in some parts of the district, i.e. in Vani, Maregaon and Ghatanji blocks are coarser.

3.B.7 Rivers and Irrigation Status

The most important rivers in Yavatmal district are Wardha and Penganga. which flows from north east and southern boundary of district. Bembla and Nirguda are the main tributaries of Wardha, which flows from Babhulgaon and Vani tahsils, respectively. Penganga have six main tributaries in district *viz.* Pus, Arunavati, Adan, Vagadi, Khuni, Vidarbha.

Water is one of the important resources for the development of agriculture. There are five major irrigation projects and 9 medium irrigation projects and 102 minor irrigation projects in Yavatmal district. However, there is shortage of water during summer season.

3.B.8 Rainfall

The district receives rainfall mostly from South-West monsoon. Rainfall is not uniform in all parts of the district. The average rainfall ranges between 500 to 800 mm.

3.B.9 Population

Total population of the district as per the 2011 census is 2772248. The male population is 1419965 and the female population is 1352283. The density of population per sq.km is 1873 and the sex ratio is 956.

3.B.10 Land Use Pattern of Yavatmal District

Total reported area for land utilization of Yavatmal district for the year 2016-17 was 1352 thousand ha. Out of which, area under forest was 239 thousand ha. and uncultivable land was 87 thousand ha., net area sown was 792 thousand ha. Table 4.2 reveals the land use pattern of Yavatmal district.

Table 3.2 Land Use Pattern of Yavatmal District (2016-17)

Sr. No.	Particulars	Area ('000' ha)	Percentage to the total
1	Total geographical area	1352	100
2	Area under forest	239	17.7
3	Area not available for cultivation		
	A) Land put to non-Agril. uses	42	3.10
	B) Barren and uncultivable land	45	3.30
	Total	87	6.40
4	Other uncultivable land excluding fallow land	73	5.40
5	Fallow land	161	11.93
6	Net area sown	792	58.57

(Source: Socio-Economic Survey of Yavatmal district, 2017)

3.B.11 Cropping Pattern

Cropping pattern of the district was dominated by cotton, cereals, pulses and oilseed crops. The proportion of total cereals in Yavatmal district was 8.41 per cent, total pulses 29.25 per cent, total food grains 37.66, total oilseed 25.25 per cent, and cotton 36.09 per cent, respectively to total cropped area for the year 2016-17.

3.B.12 Livestock

Livestock is an integral part of agriculture and consists of cattle, buffaloes, sheep, goat, pigs, and poultry.

The number of total livestock population of the district was 1145243 out of which cattle population is 720201, buffaloes 96220, sheep 24661, goats 299257and total poultry was 640091 (Livestock Census 2012).

3.B.13 Co-operation

Co-operative sector covers aspects of agricultural needs such as extension of agricultural credit and provision of agricultural input through co-operative societies. In Yavatmal district, there are 595 primary agriculture credit co-operative societies, 37 co-operative milk societies, 4 sugar factories and 4 ginning factories.

3.B.14 Infrastructure

3.B.14.1 Transport

3.B.14.1a Railways

The total length of railway line passing through the district is only 64 km. Yavatmal to Murtizapur railway narrow-gauge line passes through Yavatmal district. Yavatmal and Darwha, two blocks of the district, are only linked up with the narrow-gauge line. Yavatmal district is not well connected with the other major cities.

3.B.14.1b Roads

The district is having a total road length of 31569 km as on March 2017. The city is connected with major cities in Maharashtra as well as other business and industrial centres in and outside the state. The National Highway passes through the Yavatmal district.

3.B.14.1c Air transport

At present, there is one airport available in the district but it’s not in operation. However, Nagpur Airport, which is 140 km. away from Yavatmal serves the needs of the industrialists and traders.

3.B.14.2 Communication

Communication facilities like fax, telephone, E-mail, internet, telex etc., are pre-requisite for development of industry in any area. Information can be transmitted from place to another, within a short period of time with the help of this new communication aids. There are 370 post offices, and telephone exchanges in Yavatmal district. The district has 1199 public telephones. All talukas, district headquarters and important places are connected by telephones. (District Statistical Abstract, 2016-17).

3.B.15 APMCs

There are 17 APMCs in the Yavatmal district, one at each taluka place.

4. RESULTS AND DISCUSSION

The success of any enterprise in agriculture can be judged on the basis of economic benefits to be accrued by the entrepreneur from that enterprise. In the present world of competition, the farmers have to look upon his farm production activities from the business point of view. Therefore, present investigation is intended to study the economics of production and marketing of soybean in Yavatmal district of Maharashtra state. Data regarding cost of production and marketing of soybean have been collected by special interview method. The data collected have processed, tabulated, analysed and discussed to draw valid conclusion, it also gives implications for future policy and research. In accordance with the specified objective, the chapter is arranged in four sections.

In this chapter, an attempt has been made to study the socio-economic aspects, land holding and cropping pattern of soybean farmers, the cost of cultivation, gross income, net profits, production and disposal pattern of soybean, marketing channels, marketing costs, price spread, marketing efficiency and problems in production and marketing of soybean.

4.1 Family Size and its Composition

The study of family size and its composition is important to get an idea about labour force available for farm operation from the family. The detail includes number of males, female and children and are presented in Table 4.1.

Information presented in Table reveals that, the average size of family in small group was 4.33 members of which average male, female and children were 27.70 per cent, 26.15 per cent and 46.15 per cent, respectively, of which workers were 58.20 per cent.

Table 4.1 Family Size and its Composition **(No./ Farm)**

Sr. No.	Particulars	Size group			
		Small	**Medium**	**Large**	**Overall**
1	Male	1.20 (27.70)	1.31 (27.86)	1.30 (26.90)	1.27 (27.47)
2	Female	1.13 (26.15)	1.23 (26.43)	1.30 (26.90)	1.22 (26.51)
3	Children	2.00 (46.15)	2.13 (45.71)	2.23 (46.20)	2.12 (46.02)
4	Worker	2.52 (58.20)	2.43 (52.03)	2.74 (56.73)	2.50 (54.23)
5	Non-Worker	1.81 (41.80)	2.24 (47.97)	2.09 (43.27)	2.11 (45.77)
6	**Total**	**4.33 (100)**	**4.67 (100)**	**4.83 (100)**	**4.61 (100)**

(Figures in parentheses are the percentages to the respective total)

There were 4.67 members in medium size group of which males, female and children were 27.86, 26.43, and 45.71 per cent, respectively. In large size group the average number of family member were 4.83 of which male, female and children were 26.90, 26.90, and 46.20 per cent, respectively. At overall level, average size of family was 4.61 of which 27.47, 26.51 and 46.02 per cent were male, female and children's, respectively. From this table it is concluded that, average workers in family of selected soybean farmers were 54.23 per cent of total family members, the family labour force is more in small farmers group followed by large and medium farmers group.

4.2 Education Status of Selected Farmers

Education is another important factor influencing managerial ability and technical knowledge of the farmers. It was noticed that, in small size group, only 7.69 per cent family members were having education up to degree level. 17.69 per cent family members were having higher secondary education, 33.08 per cent were having up to secondary education, 33.08 per cent family members were having up to primary education and 8.46 per cent family members were illiterate.

Table 4.2 Education Status of Selected Farmers **(No./Farm)**

Sr. No.	Particulars	Size group			
		Small	**Medium**	**Large**	**Overall**
1	Upto Primary	1.43 (33.08)	0.73 (15.63)	1.00 (20.68)	1.07 (23.12)
2	Upto Secondary	1.43 (33.08)	1.73 (37.04)	1.60 (33.10)	1.58 (34.22)
3	Upto Higher Secondary	0.77 (17.69)	0.97 (20.78)	1.33 (27.59)	1.02 (22.17)
4	Upto graduation	0.33 (7.69)	0.77 (16.49)	0.47 (9.66)	0.52 (11.33)
5	Illiterate	0.37 (8.46)	0.47 (10.06)	0.43 (8.97)	0.42 (9.16)
	Total	**4.33 (100)**	**4.67 (100)**	**4.83 (100)**	**4.61 (100)**

(Figures in parentheses are the percentages to the respective total)

In medium size group, 15.63 per cent family members were having up to primary education, 37.04 per cent family members were having secondary education, 20.78 per cent family members were having higher secondary education, 16.49 per cent family members were having education up to degree level, and 10.06 per cent family members were illiterate.

In large size group, 20.68 per cent family members were having up to primary education, 33.10 per cent family members were having secondary education, 27.59 per cent family

members were having higher secondary education, 9.66 per cent family members were having education up to degree level, and 8.97 per cent family members were illiterate.

At overall level, 23.12 per cent family members were having up to primary education, 34.22 per cent family members were having secondary education, 22.17 per cent family members were having higher secondary education, 11.33 per cent family members were having education up to degree level, and 9.16 per cent family members were illiterate.

It is also concluded from above table that, the highly qualified members are more in medium size group, followed by large and small size groups.

4.3 Land Use Pattern of Sample Farmers

Information presented in Table 4.3 depicted that, the total land holding in respect of small, medium and large size group was 1.60 ha, 2.33 ha and 3.47 ha, respectively and at overall level, it was 2.47 ha. The net cropping area for small, medium and large size groups was 1.44 ha, 2.12 ha and 3.24 ha, respectively and at overall level, it was 2.27 ha. At overall level, cropping intensity was observed as 140.73 per cent.

From the following table it is seen that, the percentage of operational holding was increased with increase in size groups, also the area under irrigated land followed same pattern.

Table 4.3 Land Use Pattern of Sample Farmers **(ha/Farm)**

Sr. No	Particulars	Size Group			
		Small	Medium	Large	Overall
1	Total land holding	1.60 (100)	2.33 (100)	3.47 (100)	2.47 (100)
2	Permanent fallow	0.10 (6.21)	0.12 (5.25)	0.17 (4.83)	0.13 (5.26)
3	Operational holding	1.50 (93.79)	2.21 (94.75)	3.30 (95.17)	2.34 (94.74)
	a) Irrigated	0.78 (48.92)	1.20 (51.51)	2.52 (72.74)	1.51 (60.90)
	b) Unirrigated	0.66 (41.24)	0.92 (39.28)	0.72 (20.65)	0.76 (30.97)
4	Current fallow	0.06 (3.64)	0.09 (3.96)	0.06 (1.78)	0.07 (2.87)
5	Net cropping area	1.44 (90.15)	2.12 (90.79)	3.24 (93.39)	2.27 (91.87)
6	Gross cropped area	2.04	2.79	4.73	3.19
	Cropping intensity %	141.52	131.99	146.09	140.73

(Figures in parentheses are the percentages to the total holding)

4.4 Cropping Pattern of Selected Farmers

Cropping pattern refers to proportion of the area under different crops. The Table 4.4 presented the information on area under different crops during the year 2018-19, on the farms of sample soybean farmers.

At the overall level, cotton occupied 26.94 per cent of the gross cropped area. Pigeon pea and green gram occupied 7.50 and 3.18 per cent area to the gross cropped area, respectively. In *rabi* season at the overall level, major crops were wheat and gram which accounted 8.24, and 14.39 per cent, respectively.

Table 4.4 Cropping Pattern of Selected Farmers **(ha/farm)**

Sr. No	Particulars	Size group			
		Small	Medium	Large	Overall
1	**Kharif Crops**				
	a) Cotton	0.71 (34.77)	0.87 (31.22)	0.70 (14.83)	0.76 (26.94)
	b) Soybean	0.35 (16.89)	0.63 (22.57)	1.84 (38.97)	0.94 (26.14)
	c) Pigeon pea	0.16 (7.91)	0.19 (6.84)	0.37 (7.74)	0.24 (7.50)
	d) Green gram	0.06 (2.94)	0.15 (5.25)	0.06 (1.34)	0.09 (3.18)
	e) Kharif Jowar	0.11 (5.22)	0.10 (3.61)	0.09 (1.90)	0.10 (3.58)
	f) Bajra	0.01 (0.33)	0.01 (0.48)	0.01 (0.21)	0.01 (0.34)
	g) Black gram	0.02 (0.82)	0.08 (2.99)	0.02 (0.49)	0.04 (1.43)
	h) Other	0.00 (0.00)	0.01 (0.18)	0.00 (0.00)	0.00 (0.06)
	Sub Total	**1.41 (68.87)**	**2.04 (73.13)**	**3.10 (65.49)**	**2.18 (69.16)**
2	**Rabi Crops**				
	a) Wheat	0.18 (8.89)	0.28 (9.91)	0.28 (5.92)	0.25 (8.24)
	b) Gram	0.14 (6.98)	0.32 (11.46)	1.17 (24.74)	0.54 (14.39)
	Sub Total	**0.32 (15.88)**	**0.60 (21.37)**	**1.45 (30.66)**	**0.79 (22.63)**
3	**Vegetables**	0.06 (3.02)	0.08 (2.87)	0.09 (1.88)	0.08 (2.59)
4	**Total Perennials**	0.03 (1.47)	0.07 (2.63)	0.09 (1.97)	0.07 (2.02)
5	**Summer Groundnut**	0.22 (10.77)	0.00 (0.00)	0.00 (0.00)	0.07 (3.59)
	Gross Cropped Area	**2.04 (100.00)**	**2.79 (100.00)**	**4.73 (100.00)**	**3.19 (100.00)**

(Figures in parentheses are the percentages to the gross cropped area)

The total area under soybean was 16.89, 22.57, 38.97 and 26.14 per cent on small, medium, large groups and overall level, respectively, to the gross cropped area of the sample farmers.

In kharif, cotton crop occupied 34.77, 31.22, and 14.83 per cent area, respectively in small, medium and large size groups.

At the overall level, the gross cropped area was 3.19 ha. It was 2.04, 2.79 and 4.73 ha in small, medium and large size groups, respectively.

It is clear from the table that, the cropping pattern of selected farmers in kharif is dominated by soybean and cotton, the area under cotton has decreased and area under soybean has increased proportionately with increase in size groups.

4.5 Farm Assets and Investment of Sample Farmers

Investment in farm assets is presented in Table 4.5. It can be observed that, per farm total value of investment in farm assets excluding land was worked out to ₹ 420822.66, ₹ 649576.16 and ₹ 919507.34 for small, medium and large size group, respectively. At overall level, investment in farm assets excluding land was worked out to ₹ 662869.83.

Table 4.5 Farm Assets and Investment of Sample Farmers (₹/Farm)

Sr. No	Particulars	Size group			
		Small	Medium	Large	Overall
1	Land	1023687 (70.87)	1456231 (69.15)	2168752 (70.23)	1543964 (69.96)
2	Houses and Cattle Shed	243416.67 (16.85)	376783.33 (17.89)	488100.00 (15.81)	369433.33 (16.74)
3	Irrigation Structure	98753.33 (6.84)	106233.33 (5.04)	164983.33 (5.34)	123323.33 (5.59)
4	Bullock Drawn Implements	11108.33 (0.77)	9820.00 (0.47)	13571.67 (0.44)	11067.78 (0.50)
5	Tractor and its Implements	0.00 (0.00)	61400.00 (2.92)	148966.67 (4.82)	70122.22 (3.18)
6	Livestock	65593.33 (4.54)	93060.00 (4.42)	100870.00 (3.27)	86507.78 (3.92)
7	Hand Tools and Implements	1951.00 (0.14)	2279.50 (0.11)	3015.67 (0.10)	2415.39 (0.11)
8	**Total assets including land**	**355229.33 (100.00)**	**556516.16 (100.00)**	**818637.34 (100.00)**	**576362.05 (100.00)**
9	**Total assets excluding land**	**420822.66 (29.13)**	**649576.16 (30.85)**	**919507.34 (29.77)**	**662869.83 (30.04)**

(Figures in parentheses are the percentages to the respective total)

In small size group, per farm investment on irrigation structure was 6.84 per cent, bullock drawn implements 0.77 per cent, livestock 4.54 per cent.

In medium size group, per farm investment on irrigation structure was 5.04 per cent, bullock drawn implements 0.47 per cent, tractor and its implements 2.92 per cent, livestock 4.42 per cent.

In large size group, per farm investment on irrigation structure was 5.34 per cent, bullock drawn implements 0.44 per cent, tractor and its implements 4.82 per cent, livestock 3.27 per cent.

At overall level, per farm investment on irrigation structure was 5.59 per cent, bullock drawn implements 0.50 per cent, tractor and its implements 3.18 per cent, livestock 3.92 per cent.

From the above table it is also concluded that, the major contribution in farm assets was of land followed by the houses and cattle shed. Large size group farmers have invested more in tractor and its implements compared to small and medium farmers.

4.6 Livestock Position of Selected Farmers

Livestock plays an important role in soybean cultivation. Table 4.6 showed that, at the overall level, per farm value of bullock pair, cow and buffalo were ₹ 45755.56, ₹ 20644.44 and ₹ 11611.11 which accounted for 52.89 per cent, 23.86 per cent and 13.42 per cent, respectively.

Table 4.6 Livestock Position of Sample Farmers **(Value in ₹/Farm)**

Sr. No	Particulars	Size Group			Overall
		Small	Medium	Large	
1	Bullock pair	36333.33 (55.39)	47200.00 (50.72)	53733.33 (53.27)	45755.56 (52.89)
2	Cow	15966.67 (24.34)	23366.67 (25.11)	22600.00 (22.41)	20644.44 (23.86)
3	Cow calf	2850.00 (4.34)	4933.33 (5.30)	1916.67 (1.90)	3233.33 (3.74)
4	Buffalo	3333.33 (5.08)	11600.00 (12.47)	19900.00 (19.73)	11611.11 (13.42)
5	Buffalo calf	400.00 (0.61)	1533.33 (1.65)	1300.00 (1.29)	1077.78 (1.25)
6	Goat / sheep	6483.33 (9.88)	4366.67 (4.69)	1200.00 (1.19)	4016.67 (4.64)
7	Poultry	226.67 (0.35)	60.00 (0.06)	220.00 (0.22)	168.89 (0.20)
	Total	**65593.33 (100.00)**	**93060.00 (100.00)**	**100870.00 (100.00)**	**86507.78 (100.00)**

(Figures in parentheses are the percentages to the respective total)

In small size group, per farm value of bullock pair, cow, buffalo and goat were ₹ 36333.33, ₹ 15966.67, ₹ 3333.33 and ₹ 6483.33 which accounted for 55.39 per cent, 24.34 per cent, 5.08 per cent and 9.88 per cent of total value, respectively.

In medium size group, per farm value of bullock pair, cow, buffalo and goat were ₹ 47200.00, ₹ 23366.67, ₹ 11600.00 and ₹ 4366.67 which accounted 50.72 per cent, 25.11 per cent, 12.47 per cent and 4.69 per cent of total value, respectively.

In large size group, per farm value of bullock pair, cow, buffalo and goat were ₹ 53733.33, ₹ 22600.00, ₹ 19900.00 and ₹ 1200.00 which accounted 53.27 per cent, 22.41 per cent and 19.73 per cent and 1.19 per cent of total value, respectively.

It is concluded from above table that; small size farmers group have invested more in bullock pair (55.39 per cent) and the proportion have decreased with increase in size groups. The same pattern is followed in case of sheep and goat. At overall level, the major contribution in livestock was of bullock pair, followed by cows.

4.7 Resource Use Level of Soybean

Per hectare inputs used in soybean were estimated and presented in Table 4.7. At the overall level, human labour used was 38.69-man days, bullock labour 1.75 pair days, machine power 5.40 hr, seed 75.43 kg and manure 16.97 q were used, respectively.

Use of human labour was highest in small size group 61.45-man days whereas in medium and large group, it was 43.76 day and 32.69-man days, respectively. The fertilizers use was high in small size group as compared to medium and large size groups.

Table 4.7 Resource Use Levels of Soybean **(per ha)**

Sr. No.	Particulars	Size Group			Overall
		Small	Medium	Large	
1	Total human labour (Man Days)	61.45	43.76	32.69	38.69
	a. Male	25.22	17.41	13.71	15.94
	b. Female	36.23	26.35	18.98	22.75
2	Bullock labour (Pair days)	4.74	2.03	1.09	1.75
3	Machine power (hr)	5.87	5.79	5.40	5.40
4	Seed (Kg)	73.62	72.91	76.64	75.43
5	Manures (q)	11.88	16.51	18.08	16.97
6	Fertilizers (Kg)				
	a. N	29.88	22.86	23.35	24.04
	b. P	71.36	70.84	64.99	67.08
	c. K	12.50	16.65	16.41	15.98
7	Plant protection charges (₹)	785.02	841.75	858.55	845.80

Plant protection charges ₹ 858.55 was high in large size group followed by medium ₹ 841.75 and small ₹ 785.02 size groups, respectively. Along with this, seed 76.64 kg/ha, and manures 18.08 q were high in large size group.

4.8 Cost of Cultivation of Soybean

Cost of cultivation was estimated by using standard cost concepts and same is presented in Table 4.8.

At overall level, the per hectare cost of cultivation of soybean worked out to be ₹ 45588.49. The cost 'A' was ₹ 29613.43 contributing 64.17 per cent share in the cost 'C'. In cost 'A', the major item of cost was total hired human labour i.e. ₹ 5287.40 contributing 11.46 per cent share in the cost 'C'. The per hectare expenditure on machine power was worked out to ₹ 3039.62 contributing 6.59 per cent share in the cost 'C'. The expenditure on bullock labour, manure, seed, fertilizer, plant protection charges and weedicide were worked out to ₹ 837.67, ₹ 2515.38, ₹ 4816.46, ₹ 4490.97, ₹ 845.80 and ₹ 1478.92 which accounted for 1.82, 5.45, 10.44, 9.73, 1.83, and 3.20 per cent share in cost 'C' respectively. In the cost 'B' the major items of expenditure were the rental value of land and interest on fixed capital which worked out to be ₹ 8802.59 and ₹ 5448.00 in order to constituting 19.31 and 11.95 per cent share in the total cost 'C', respectively.

In case of small size group, the per hectare cost of cultivation was ₹ 46376.38. Out of which cost 'A' was ₹ 29047.20 constituting 62.63 per cent in the total cost (i.e. cost 'C'). In the cost 'A' the major item was hired human labour worked out to ₹ 6120.77 constituting 13.20 per cent share in the total cost 'C'. The per hectare expenditure on seed and fertilizer was worked out to ₹ 4572.66, ₹ 3962.86 which accounted for 9.86, and 8.55 per cent share in the total cost 'C' respectively. In case of cost 'B' the major items of expenditures were rental value of land and interest on fixed capital contributing 19.85 and 8.12 per cent share in the total cost 'C', respectively.

In case of medium size group, per hectare cost of cultivation was ₹ 45867.61. The per hectare cost 'A' incurred in soybean production was ₹ 29496.71 which accounted for 64.31 per cent share in the total cost 'C'. The major item of cost 'A' was hired human labour which is worked out to ₹ 5846.56 and its share in the cost 'C' was 12.75 per cent. The expenditure on fertilizer was ₹ 4495.25 and its share in the cost 'C' was 9.80 per cent. The expenditure on seed constituted 9.74 per cent share in the total cost. In the cost 'B', the major item of expenditure was rental value of land constituting 20.56 per cent in the cost 'C'.

In case of large size group, the per hectare cost of cultivation was ₹ 45345.64. Out of which cost 'A' was ₹ 29759.30 constituting 64.41 per cent in the total cost (i.e. cost 'C'). In the cost 'A' the major item was seed (₹ 4981.37) constituting 10.78 per cent share in the total cost 'C'. The per hectare expenditure on hired human labour was worked out to ₹ 4940.33 which accounted for 10.69 per cent share in the total cost 'C'. The expenditure on bullock labour, machine, manure, fertilizer, plant protection charges and weedicide were worked out to ₹ 546.11, ₹ 2924.95, ₹ 2712.48, ₹ 4588.34, ₹ 858.55, and ₹ 1595.53 which accounted for 1.18, 6.33, 5.87, 9.93, 1.86, and 3.45 per cent share, respectively in cost 'C'.

Table 4.8. Cost of Cultivation of Soybean

Sr. No	Cost Items	Size Group											
		Small			Medium			Large			Overall		
		Qty	Value	Per cent (%)	Qty	Value	Per cent (%)	Qty	Value	Per cent (%)	Qty	Value	Per cent (%)
I) 1	Hired human labour (Man days)												
	a) Male	14.01	2801.93	6.04	13.60	2719.58	5.93	12.28	2455.70	5.32	12.79	2557.07	5.54
	b) Female	22.13	3318.84	7.16	20.85	3126.98	6.82	16.56	2484.63	5.38	18.20	2730.34	5.92
	Total hired human labour	36.14	6120.77	13.20	34.45	5846.56	12.75	28.84	4940.33	10.70	30.99	5287.41	11.46
2	Bullock labour (Pair days)	4.74	2070.05	4.46	2.03	1015.87	2.21	1.09	546.11	1.18	1.75	837.67	1.82
3	Machine power (hrs)	5.87	3560.39	7.68	5.79	3089.95	6.74	5.40	2924.95	6.33	5.55	3039.62	6.59
4	Manures (q)	11.88	1630.43	3.52	16.51	2423.28	5.28	18.08	2712.48	5.87	16.97	2515.38	5.45
5	Seed (Kg)	73.62	4572.66	9.86	72.91	4467.46	9.74	76.64	4981.37	10.78	75.43	4816.46	10.44
6	Fertilizers (Kg)		3962.86	8.55		4495.25	9.80		4588.34	9.93		4490.97	9.73
	N	29.88			22.86			23.35			24.04		
	P	71.36			70.84			64.99			67.08		
	K	12.50			16.65			16.41			15.98		
7	Plant protection charges (₹)		785.02	1.69		841.75	1.84		858.55	1.86		845.80	1.83
8	Weedicide (₹)		1051.21	2.27		1371.96	2.99		1595.53	3.45		1478.92	3.20
9	Incidental charges (₹)		474.88	1.02		533.60	1.16		547.11	1.18		535.25	1.16
10	Repairs (₹)		351.21	0.76		395.50	0.86		409.58	0.89		399.29	0.87
	Working capital (₹)		**24579.48**	**53.00**		**24481.18**	**53.37**		**24104.36**	**52.17**		**24246.76**	**52.54**

Table 4.8 Contd…

Sr. No	Cost Items	Size Group											
		Small			Medium			Large			Overall		
		Qty	Value	Per cent (%)	Qty	Value	Per cent (%)	Qty	Value	Per cent (%)	Qty	Value	Per cent (%)
11	Int. on working capital @ 6 % (₹)		1474.77	3.18		1468.87	3.20		1446.26	3.13		1454.81	3.15
12	Depre. on farm implements		2884.74	6.22		3433.43	7.49		4110.52	8.90		3809.11	8.25
13	Land revenue and taxes		108.21	0.23		113.23	0.25		98.16	0.21		123.46	0.27
	Cost 'A'		**29047.20**	62.63		**29496.71**	64.31		**29759.30**	64.41		**29613.43**	64.17
14	Rental value of land		9207.47	19.85		9428.24	20.56		8512.99	18.77		8802.59	19.31
15	Int. on fixed capital @ 10 % (₹)		3764.22	8.12		4990.28	10.88		5919.57	13.05		5448.00	11.95
	Cost 'B'		**42018.89**	90.60		**43915.23**	95.74		44771.79	98.73		44243.33	97.05
16	Family labour											0.00	
	a. Male	11.21	2241.55	4.83	3.81	1126.98	2.46	1.43	285.71	0.63	3.16	713.19	1.56
	b. Female	14.11	2115.94	4.56	5.50	825.40	1.80	2.42	288.14	0.64	4.54	631.98	1.39
	Cost 'C'		**46376.38**	100		**45867.61**	100		**45345.64**	100		**45588.49**	100
II	Gross income (₹)		55894.08			57248.81			51666.86			53556.28	
	a. Main product	16.19	54879.59		15.89	55957.80		14.85	50630.70		15.24	52465.80	
	b. By product	10.14	1014.49		10.48	1291.01		10.36	1036.17		10.36	1090.48	
III	Per quintal cost		2864.79			2887.25			3054.34			2993.79	

4.9 Costs, Returns, Gross Income and B:C Ratio for Soybean

At the overall level, the per hectare gross return was found to be ₹ 53556.28. The per hectare gross returns of soybean in small, medium and large size group were ₹ 55894.08, ₹ 57248.81 and ₹ 51666.86, respectively as depicted in Table 4.9.

At the overall level, net returns obtained from soybean at cost 'C' was ₹ 7967.79 per hectare. It was obtained from soybean at cost 'C' was ₹ 9517.70, ₹ 11381.20 and ₹ 6321.22 per hectare from small, medium and large groups, respectively.

The benefit cost ratio indicates the return from each rupee investment in soybean cultivation. The result revealed that, the B:C ratio was highest in medium size group and it was 1.25. Similarly, B:C ratio was 1.21 and 1.14 for small and large size groups, respectively. At overall level, B:C ratio at cost 'C' was 1.17. It clearly indicates that, the soybean cultivation is a profitable crop.

Table 4.9 Costs, Returns, Gross Income and B:C Ratio for Soybean (per ha)

Sr. No.	Particulars	Size group				
		Unit	Small	Medium	Large	Overall
1	Total cost					
	i) Cost 'A'	₹	29047.20	29496.71	30339.23	29992.73
	ii) Cost 'B'	₹	42018.89	43915.23	44771.79	44243.33
	iii) Cost 'C'	₹	46376.38	45867.61	45345.64	45588.49
2	Profit at					
	i) Cost 'A'	₹	26846.88	27752.10	21327.63	23563.55
	ii) Cost 'B'	₹	13875.19	13333.58	6895.08	9312.96
	iii) Cost 'C'	₹	9517.70	11381.20	6321.22	7967.79
3	Production	q	16.19	15.89	14.85	15.24
4	Gross income	₹	55894.08	57248.81	51666.86	53556.28
5	B:C ratio					
	i) Cost 'A'		1.92	1.94	1.70	1.79
	ii) Cost 'B'		1.33	1.30	1.15	1.21
	iii) Cost 'C'		1.21	1.25	1.14	1.17

4.10 Functional Analysis

Production of soybean involved relationship between inputs and their outputs. It provides a tool by means of which the problems of production can be analysed.

The empirical evidences from previous studies suggest that amongst the many mathematical functions, Cobb-Douglas type of production function is the appropriate one for the study of resource productivity, because it specifies diminishing productivity and diminishing marginal rate of substitution among the factor and gives specific diminishing, increasing or constant returns. The data were therefore, subjected to functional analysis by using the following type of Cobb-Douglas production function

$$Y = a\ X_1^{b1}\ X_2^{b2} \text{----------}\ Xn^{bn} + e^{u}.$$

In this functional formula 'Y' is dependent variable, Xi's are independent resource variables, 'a' is constant representing intercept of the production function and bi's are the regression coefficients. In logarithmic terms, this function transforms into a linear form of the following type.

Log Y = log a + b_1 log X_1 + $b_2$log X_2 + -------- + bn log Xn + u log e.

For fitting the production function, nine inputs *viz.*, human labour, bullock labour, machine power, seed, manure, nitrogen, phosphorus, potassium, and plant protection have been considered as important factors in the production of crop.

The output of the crop has been used as dependant variable. The equation fitted was in the following form

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b6}X_7^{b7}X_8^{b8}\ X_9^{b9} + e^u$$

Where,

Y = Output of main produce (q/ha)

X_1 = Human labour (man days/ha)

X_2 = Bullock labour (pair days/ha)

X_3 = Machine power (hrs)

X_4 = Seed (Kg/ha)

X_5 =Manures (q/ha)

X_6 = Nitrogen (kg/ha)

X_7 = Phosphorus (kg/ha)

X_8 = Potassium (kg/ha)

X_9 = Plant protection (₹/ha)

u = Error term

a = Intercept

bi's = Regression coefficient

In case of small size group of holdings, the value of coefficient of multiple determination (R^2) was found to be 0.68, that means 68 per cent variation in output was jointly explained by the nine independent resource variables under consideration (Table 4.10).

The regression coefficient of potassium (X_8) was positive and significant at 1 per cent level of significance. Manures (X_5) was positive and significant at 5 per cent level of significance. The regression coefficients of nitrogen (X_6), plant protection (X_9) were positive and significant at 10 per cent level of significance. This indicates that there is scope to increase the use of these resources to increase the production.

As we consider at the small size group, positive and significant coefficients indicated that, one per cent increase in the use of manures (X_5), nitrogen (X_6), potassium (X_8), and plant protection (X_9) will increase the yield by 0.03, 0.17, 0.10, and 0.18 per cent, respectively.

In case of medium size group of holdings, the estimated parameters of machine (X_3), nitrogen (X_6), and potassium (X_8), were significant indicating that for every one unit increase in

the expenditure on these resources would results in increased gross return by 0.09 per cent, 0.31 per cent and 0.79 per cent, respectively. The value of coefficient of multiple determinations (R^2) was found to be 0.93, that means 93 per cent variation in output was jointly explained by the nine independent resource variables under consideration. However, human labour (X_1), manure (X_5), plant protection (X_9) were not significant but positive, it indicates that they have positive impact on output.

In case of large size group of holdings, the value of coefficient of multiple determination R^2 was found to be 0.72 that means 72 per cent variation in output was jointly explained by the nine independent variables under consideration. The regression coefficient of nitrogen (X_6), was positive and significant at 1 per cent level of significance. Bullock labour (X_2), and plant protection (X_9) were positive and significant at 5 per cent level of significance.

If we increase one unit of bullock labour (X_2), nitrogen (X_6) and plant protection (X_9), will increase the yield by 0.13, 0.44 and 0.39 per cent, respectively. However, machine (X_3), seed (X_4), manure (X_5), phosphorus (X_7), and potash (X_8), were positive and not significant but have positive impact on output.

At the overall level, coefficient of multiple determinations (R^2) was found to be 0.75 indicating that 75, per cent variation in output was jointly explained by the above considered independent variables. The regression coefficient of seed (X_4) and manure (X_5) were positive and non-significant.

The regression coefficient of human labour (X_1), machine (X_3), phosphorus (X_7), potassium (X_8), and plant protection (X_9) were positive and significant at 1 per cent level of significance. The regression coefficient of nitrogen (X_6) was positive and significant at 10 per cent level of significance.

At the overall level, positive and significant coefficients indicated that, one per cent increase in the use of human labour (X_1), machine (X_3), nitrogen (X_6), phosphorus (X_7), potassium (X_8) and plant protection (X_9) will increase the yield by 0.13, 0.23, 0.08, 0.76, 0.09 and 0.17 per cent, respectively. Other resources like seed (X_4) and manure (X_5) were found non-significant.

Table 4.10. Results of Estimated Cobb-Douglas Production Function for Different Size Groups of Soybean Farmers

Sr. No.	Particulars	Unit	Group			
			Small	Medium	Large	Overall
1	Intercept		1.318	0.303	0.298	1.349
2	Human labour (X_1)	Days	0.173 (0.131)	0.117 (0.125)	-0.332*** (0.103)	0.133*** (0.046)
3	Bullock labour (X_2)	Days	-0.148* (0.083)	-0.005 (0.031)	0.138** (0.063)	-0.015 (0.012)
4	Machine power (X_3)	hrs	0.026 (0.186)	0.099* (0.050)	0.038 (0.030)	0.231*** (0.056)
5	Seed (X_4)	kg	-0.065* (0.054)	-0.078 (0.084)	0.043 (0.141)	0.016 (0.159)
6	Manures (X_5)	q	0.034** (0.013)	0.001 (0.002)	0.001 (0.002)	0.003 (0.002)
7	N (X_6)	Kg	0.172* (0.085)	0.315*** (0.104)	0.441*** (0.112)	0.083* (0.048)
8	P (X_7)	Kg	0.056 (0.049)	-0.382*** (0.113)	0.049 (0.039)	0.762*** (0.195)
9	K (X_8)	Kg	0.104*** (0.030)	0.790*** (0.249)	0.006 (0.048)	0.095*** (0.023)
10	Plant protection (X_9)	₹	0.184* (0.104)	0.012 (0.014)	0.394** (0.169)	0.178*** (0.055)
11	R^2		0.68	0.93	0.72	0.75

***,**,* Indicate significant at 1, 5 and 10 per cent level respectively.
(Figures in the parentheses are the standard errors of the respective regression coefficient)

4.11 Resources Use Efficiency

An efficiency of resources used in soybean production on the sample farms was judged with the help of MVP/MC ratio and the results are presented in Table 4.11.

It is revealed from the Table that, the ratio of marginal value of product to factor cost ratio (MVP/MC) was greater than unity (i.e. underutilization) in case of resources like manure (X_5), nitrogen (X_4), potash (X_6) and plant protection (X_9) for small size group, implying the achievement of higher resource use efficiency in case of above mentioned variables, whereas the MVP/MC ratio of human labour (X_1), machine (X_3), seed (X_4), and phosphorus (X_7) were found to be less than unity i.e. over utilization for these resources. In small size group, the human labour (X_1), machine (X_3), seed (X_4), and phosphorus (X_5) were over utilized, that means there is no need to increase these inputs for increasing the output.

In case of medium size group, the ratio of marginal value of product to factor cost ratio (MVP/MC) was greater than unity in case of resources like machine (X_3), nitrogen (X_6) and potash

(X_8) implying the achievement of higher resource use efficiency in case of above mentioned variables, whereas the MVP/MC ratio of human labour (X_1), bullock labour (X_2), seed (X_4), manure (X_5), phosphorus (X_7), and plant protection (X_9) were found to be less than unity depicting the inefficient use of these resources.

The ratio of marginal value of product to factor cost ratio (MVP/MC) was greater than unity in case of resources like bullock labour (X_2), nitrogen (X_6), and plant protection (X_9) for large size group, implying the achievement of higher resource use efficiency in case of above mentioned variables, whereas the MVP/MC ratio of human labour (X_1), machine (X_3), seed (X_4), manures (X_5), phosphorus(X_7), and potash (X_8) were found to be less than unity depicting the inefficient use of these resources.

At overall level, the achievement of higher resource use efficiency was observed in case of human labour (X_1), machine (X_3), nitrogen(X_6), phosphorus (X_7), potash (X_8) and plant protection (X_9) implying the efficient use of these variables, whereas the MVP/MC ratio for bullock labour (X_2), seed (X4), and manures(X_5), were found to be less than unity depicting the inefficient use of these resources. These variables were over utilized, there is no need to increase the input for increasing the output.

Table 4.11 Resource Use Efficiency in Soybean Production

Sr. No	Particulars	Units	GM	GM of Y	Unit price of output	bi Value	MP	MVP	MC	MVP/ MC
Small										
1	**Human labour (X_1)**	**Days**	61.45	16.19	3400.00	0.1734	0.0457	155.32	175.00	0.89
2	**Bullock labour (X_2)**	**Days**	4.74	16.19	3400.00	-0.1482	-0.5062	-1721.12	500.00	-3.44
3	**Machine power (X_3)**	**hrs**	5.87	16.19	3400.00	0.0257	0.0709	241.00	400.00	0.60
4	**Seed (X_4)**	**kg.**	73.62	16.19	3400.00	-0.0648	-0.0143	-48.46	60.00	-0.81
5	**Manures (X_5)**	**Qtls.**	11.91	16.19	3400.00	0.0335	0.0455	154.86	150.00	1.03
6	**N (X_6)**	**Kg.**	29.88	16.19	3400.00	0.1721	0.0933	317.11	42.55	7.45
7	**P (X_7)**	**Kg.**	71.36	16.19	3400.00	0.0564	0.0128	43.50	46.80	0.93
8	**K (X_8)**	**Rs.**	12.50	16.19	3400.00	0.1044	0.1352	459.56	19.21	23.92
9	**Plant protection (X_9)**		785.02	16.19	3400.00	0.1839	0.0038	12.90	1.00	12.90
Medium										
1	**Human labour (X_1)**	**Days**	43.76	15.89	3450.00	0.1172	0.0426	146.83	175.00	0.84
2	**Bullock labour power (X_2)**	**Days**	2.03	15.89	3450.00	-0.0045	-0.0353	-121.65	500.00	-0.24
3	**Machine (X_3)**	**hrs**	5.79	15.89	3450.00	0.0992	0.2721	938.60	400.00	2.35
4	**Seed (X_4)**	**kg.**	72.91	15.89	3450.00	-0.0782	-0.0170	-58.80	60.00	-0.98
5	**Manures (X_5)**	**Qtls.**	16.52	15.89	3450.00	0.0009	0.0009	2.99	150.00	0.02
6	**N (X_6)**	**Kg.**	22.86	15.89	3450.00	0.3153	0.2192	756.22	42.55	17.77
7	**P (X_7)**	**Kg.**	70.84	15.89	3450.00	-0.3821	-0.0857	-295.74	46.80	-6.32
8	**K (X_8)**	**kg.**	16.65	15.89	3450.00	0.7897	0.7539	2600.78	19.21	135.39
9	**Plant protection (X_9)**		841.75	15.89	3450.00	0.0124	0.0002	0.81	1.00	0.81

Table 4.11 Contd…

Sr. No	Particulars	Units	GM	GM of Y	Unit price output	bi Value	MP	MVP	MC	MVP/ MC
Large										
1	**Human labour (X_1)**	**Days**	32.69	14.85	3450.00	-0.3318	-0.1507	-519.83	175.00	-2.97
2	**Bullock labour (X_2)**	**Days**	1.09	14.85	3450.00	0.1376	1.8700	6451.63	500.00	12.90
3	**Machine power (X_3)**	**hrs**	5.40	14.85	3450.00	0.0384	0.1056	364.25	400.00	0.91
4	**Seed (X_4)**	**kg.**	76.64	14.85	3450.00	0.0430	0.0083	28.71	60.00	0.48
5	**Manures (X_5)**	**Qtls.**	18.09	14.85	3450.00	0.0006	0.0005	1.71	150.00	0.01
6	**N (X_6)**	**Kg.**	23.35	14.85	3450.00	0.4410	0.2804	967.38	42.55	22.74
7	**P (X_7)**	**Kg.**	64.99	14.85	3450.00	0.0489	0.0112	38.54	46.80	0.82
8	**K (X_8)**	**kg.**	16.41	14.85	3450.00	0.0060	0.0054	18.73	19.21	0.97
9	**Plant protection (X_9)**		858.55	14.85	3450.00	0.3941	0.0068	23.51	1.00	23.51
Overall										
1	**Human labour (X_1)**	**Days**	38.69	15.42	3425.00	0.1327	0.0529	181.20	175.00	1.04
2	**Bullock labour (X_2)**	**Days**	1.75	15.42	3425.00	-0.0148	-0.1303	-446.40	500.00	-0.89
3	**Machine power (X_3)**	**hrs**	5.55	15.42	3425.00	0.2305	0.6403	2193.12	400.00	5.48
4	**Seed (X_4)**	**kg.**	75.43	15.42	3425.00	0.0158	0.0032	11.09	60.00	0.18
5	**Manures (X_5)**	**Qtls.**	16.98	15.42	3425.00	0.0030	0.0027	9.28	150.00	0.06
6	**N (X_6)**	**Kg.**	24.04	15.42	3425.00	0.0827	0.0531	181.75	42.55	4.27
7	**P (X_7)**	**Kg.**	67.08	15.42	3425.00	0.7620	0.1752	599.95	46.80	12.82
8	**K (X_8)**	**kg.**	15.98	15.42	3425.00	0.0953	0.0919	314.85	19.21	16.39
9	**Plant protection (X_9)**		845.80	15.42	3425.00	0.1776	0.0032	11.09	1.00	11.09

4.12 Production and Disposal Pattern of Soybean on Sample Farm

4.12.1 Production

The average production of soybean produced on the sample farms, selected for the study is presented in the Table 4.12.

Table 4.12. Average Production of Soybean

Sr. No.	Size group	No. of sample farmers	Average area under soybean (ha)	Production of soybean per ha (q.)
1	Small	30	0.35	16.19
2	Medium	30	0.63	15.89
3	Large	30	1.84	14.85
4	Overall	90	0.94	15.64

It is seen from the Table 4.12 that, average area under soybean increased with an increase in the size of holdings from 0.35 to 1.84 hectares. The average productivity of soybean was highest in small size group of holdings (16.19 q/ha) followed by medium (15.89 q/ha) and large (14.85 q/ha) size group. There was no significance difference in the productivity of small and medium group of farms as indicated in table. The productivity of soybean decreased with increase in size group of holdings.

4.12.2 Disposal Pattern

The information regarding the disposal pattern of soybean among different size groups is presented in Table 4.13.

Table 4.13 Disposal Pattern of Soybean **(q)**

Sr. No.	Particulars	Size group			
		Small	Medium	Large	Overall
1	Per farm production	16.19 (100.00)	15.89 (100.00)	14.85 (100.00)	15.64 (100.00)
2	Cattle feed	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
3	Seed purpose	0.35 (2.18)	0.37 (2.33)	0.26 (1.75)	0.26 (1.66)
4	Wastage	0.06 (0.35)	0.11 (0.69)	0.04 (0.27)	0.07 (0.45)
5	Marketable surplus	15.78 (97.47)	15.41 (96.98)	14.55 (97.98)	15.31 (97.89)

(Figures in parentheses are the percentages to the per farm production)

It is seen from the Table 4.13 that, at overall level, 0.26 q of the produce was retained for seed purpose, and 0.07 q was wastages. It was observed that, the majority of the produce (97.89 per cent) was available as marketable surplus for selling in market. The farm retentions are mainly required for seed purpose and it is more in small and medium size groups. And rest is marketable surplus.

4.13 Marketing Practices of Soybean

Marketing system for agricultural commodities and inputs plays a very crucial role. Agricultural marketing plays an important role not only in stimulating production and consumption, but in accelerating the pace of economic development. For this reason, it has been described as the most important multiplier of agricultural development. Marketing is one of the important activities in the production process which facilitates the movement of goods from site of production to the consumer. Soybean is taken to threshing yard, where it is threshed and cleaned. Most of the farmers preferred gunny bags for packaging of soybean. Farmers normally used bullock carts for transportation of soybean from field to villages, where farmers can store their produce if they want to store it and take it directly to market if they want to sell it.

4.13.1 Marketing Functions Carried out by Sample Soybean Farmers

The important marketing functions observed in sale of soybean in the study area are packaging and transport.

4.13.1.1 Packaging

Packaging is an important function in case of soybean. An ideal package results into reduction of losses in transport, less decaying in storage, maintain the quality of produce and ultimately leads to better return. More than 90 per cent farmers used gunny bags for packaging of soybean because it is easily available, cheap as compared to other material, easy to carry and also reusable.

4.13.1.2 Transportation

Quick and efficient transportation of produce to the desired place has direct influence on the operational efficiency in the marketing. Transportation is essential for creation of place utility, which helps in timely supply of a particular commodity to the different markets. Transport efficiency depends upon the timely availability of vehicles, condition of roads, etc. The mode of transport varies with the nature of commodity and distance to be covered. Majority of the farmers preferred the tractor and different vehicles as transportation medium to transport soybean from village to market.

4.13.1.3 Method of sale

Farmers follow different methods of sale of soybean. APMC is one of the places where farmers can sell their produce through licensed intermediaries. Also, they can sell their soybean through village traders, who purchase the produce from field or village itself. Some large farmers use to sell their soybean to wholesaler directly.

4.13.1.4 Different marketing channels in soybean marketing

Marketing channel are the way through which the commodity flow from producer to consumer. Producers prefer different marketing channels. Marketing channels followed by soybean producers in study area are as follows,

Channel-I: Producer-Village trader -Wholesaler-Processor.

Channel-II: Producer- Commission agent -Wholesaler- Processor.

Channel III: Producer- Wholesaler-Processor.

The sample soybean farmers sold their produce through the Channel I, II and III. In which Channel II and III were prominently used by the soybean farmers.

4.14 Marketing Cost

The different marketing functions *viz.*, packing, transportation and handling of produce, etc., are required to be performed in the marketing of soybean. The cost incurred for performing these operations is very important in soybean marketing because, it reflects on the consumers price and the returns to the producer. The cost incurred on performing the operations such as packing, transportation, hamali and tolai are worked out and presented in Table 4.14.

It can be seen from the Table that, the per quintal cost of marketing of soybean for Channel-I was ₹ 30.10 and in case of Channel II and Channel III it was ₹ 121.03, ₹ 93.22, respectively. Thus, per quintal cost of marketing was highest in Channel-II (Producer–Commission agent– Wholesaler– Processor). Among the marketing cost packaging and transport charges were the major items and contributed the highest share in the total cost of marketing.

The cost of packing was high in comparison of hamali and weighing charges. The per quintal packing cost was ₹ 30.10, ₹ 29.96 and ₹ 29.60 in Channel I, Channel II and Channel III, respectively. The per quintal transportation charge were ₹ 71.25 and ₹ 47.71 in Channel II and III, respectively.

Table 4.14. Channel wise Per Quintal Marketing Cost of Soybean. (₹/q)

Sr. No	Particulars	Channels		
		Channel I (P-VT-W-P)	**Channel II (P-CA-W-P)**	**Channel III (P-W-P)**
	Price received by farmer	3254.30	3390.95	3406.87
1	Packaging charges	30.10 (100.00)	29.96 (24.75)	29.60 (31.75)
2	Transport charges	0.00 (0.00)	71.25 (58.87)	47.71 (51.18)
3	Hamali	0.00 (0.00)	9.99 (8.25)	0.00 (0.00)
4	Tolai	0.00 (0.00)	4.99 (4.13)	4.93 (5.29)
5	Commission charges	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
6	Other charges	0.00 (0.00)	4.84 (4.00)	10.98 (11.78)
7	Total marketing cost	30.10 (100.00)	121.03 (100.00)	93.22 (100.00)
	Net price received by farmer	3224.20	3269.92	3313.64

(Figures in the parentheses indicates the percentages to the total marketing cost)

4.15 Price Spread in Different Marketing Channels

Price spread refers to the difference between the price paid by the consumer (processor) and price received by the producer for a unit quantity of farm produce. Price spread consists of marketing costs and margins of the intermediaries which ultimately determine the overall efficiency of marketing system. Since bulk of the produce was sold through different channels, all selected channels were considered for analysis of price spread. The channel wise price spread and marketing margin for the sale of soybean is presented in Table 4.15.

It is observed from Table 4.15 that; higher marketing cost was incurred by wholesaler (5.39 %) followed by village trader (1.80 %) in Channel I. The net price realized by the producer was ₹ 3224.20 in Channel-I, in case of Channel-II ₹ 3269.92 and ₹ 3313.64 through Channel III. In Channel-III, where the producers sold their produce directly to wholesalers instead commission agent and village traders. Price spread was minimum in Channel-III (Producer - Wholesaler-Processor), as there was very less marketing costs and market margins between producer and processor. Price spread was maximum in Channel-II that was ₹ 570.67 followed by ₹ 550.82 in Channel I. This was due to the fact that, as the market chain increases price spread also increases.

Table 4.15 Price Spread in Different Marketing Channels of Soybean (₹/q)

Sr. No.	Particulars	Channel I	Channel II	Channel III
1	Gross price received by the farmer	3254.30 (86.21)	3390.95 (88.29)	3406.87 (89.05)
	i) Marketing cost	30.10 (0.80)	121.03 (3.15)	93.22 (2.44)
	ii) Net price realized	3224.20 (85.41)	3269.92 (85.14)	3313.64 (86.61)
2	Village Merchant			
	i) Price paid	3254.30 (86.21)	-	-
	ii) Marketing cost	68.07 (1.80)	-	-
	iii) Marketing margin	106.32 (2.82)	-	-
	iv) Price received	3428.69 (90.83)	-	-
3	Commission Agent			
	i) Price paid	-	3390.95 (88.29)	-
	ii) Marketing cost	-	12.30 (0.32)	-
	iii) Marketing margin	-	105.00 (2.73)	-
	iv) Price received	-	3508.25 (91.35)	-
4	Wholesaler			-
	i) Price paid	3428.69 (90.83)	3508.25 (91.35)	3406.87 (89.05)
	ii) Marketing cost	203.65 (5.39)	196.34 (5.11)	206.95 (5.41)
	iii) Marketing margin	142.68 (3.78)	136.00 (3.54)	212.05 (5.54)
	iv) Price received	3775.02 (100.00)	3840.59 (100.00)	3825.87 (100.00)
5	Processor			
	i) Price paid	3775.02 (100.00)	3840.59 (100.00)	3825.87 (100.00)
	Price spread	550.82	570.67	512.23

(Figures in the parentheses are the percentages to the price paid by processor)

4.16 Channel wise Marketing Efficiency of Soybean

Marketing efficiency was worked out by using modified method as suggested by Acharya and Aggarwal (1999). It is seen from the Table 4.16 that, the marketing efficiency was maximum for Channel-III (6.47), followed by Channel I (5.85) and minimum for Channel II (5.73).

Table 4.16 Channel wise Marketing Efficiency of Soybean

Channels	Price Paid by Processor	Net price received by Soybean Farmers	MC	MM	MC+MM	MME
I	3775.02	3224.20	301.82	249.00	550.82	5.85
II	3840.59	3269.92	329.67	241.00	570.67	5.73
III	3825.87	3313.64	300.17	212.05	512.22	6.47

4.17 Problems Faced by Soybean Farmers

The soybean crop is more sensitive to vagaries of weather, pest and diseases. It also requires proper operations like preparatory tillage, weeding and application of proper fertilizers and manures, etc. for better productivity.

At the time of survey, questions were asked to the sample farmers to understand the problem faced by them in production and marketing of soybean.

4.17.1 Problems in Production of Soybean

The information regarding problems in production are presented in Table 4.17. Out of 90 soybean farmers, non-availability of labour in time ranked as first by 68 respondents, second rank by 3 respondents and 1 respondent of them mentioned as last rank. Similarly, high wage rate ranked as first by 14 respondents, second ranked by 62 respondent and 1 of them mentioned as last rank.

Table 4.17 Preference and Ranking of Problems Faced by Farmers in Soybean Production

Sr. No.	Problems	Rank given by the respondent							
		I	II	III	IV	V	VI	VII	VIII
1	Lack of availability of quality seed	3	5	49	13	8	6	4	2
2	High cost of seed	2	4	7	18	46	7	2	4
3	Unavailability of labours in time	68	3	4	8	3	2	1	1
4	High wage rates	14	62	6	3	1	1	2	1
5	High cost of fertilizers	2	4	7	12	3	38	15	9
6	High cost of pesticides	1	3	6	14	3	10	41	12
7	Non- availability of sufficient institutional credit	0	5	5	7	10	12	12	39
8	Lack of technical knowledge	0	4	6	15	16	14	13	22

Table 4.18 Per cent Position and Garret Value for Problems in Production

Sr. No.	100 (Rij-0.5)/Nj	Per Cent Position	Garret Value
1	100*(1-0.5)/8	6.25	80
2	100*(2-0.5)/8	18.75	67
3	100*(3-0.5)/8	31.25	60
4	100*(4-0.5)/8	43.75	53
5	100*(5-0.5)/8	56.25	47
6	100*(6-0.5)/8	68.75	40
7	100*(7-0.5)/8	81.25	33
8	100*(8-0.5)/8	93.75	20

Garret value are calculated by using the Garret ranking conversion table. In this table, per cent position is given along with Garret score. The nearest value of per cent position is seen from the table and garret score is given to that per cent position

Problems ranked by soybean farmers are mentioned in Table 4.19. The non-availability of labour in time got the first rank, followed by high wage rate, lack of availability quality seed, high cost of seed, high cost of fertilizers, lack of technical knowledge, high cost of insecticides and pesticides, insufficient institutional credit in time II, III, IV, V, VI, VII, and VIIIth rank, respectively.

Table 4.19 Calculation of Garret Score and Ranking of Problems in Soybean Production

Sr. No.	Problems	Garret Score									%	Rank
		I	II	III	IV	V	VI	VII	VIII	Total		
1	Lack of availability of quality seed	240	335	2940	689	376	240	132	40	4992	55.47	3
2	High cost of seed	160	268	420	954	2162	280	66	80	4390	48.78	4
3	Unavailability of labours in time	5440	201	240	424	141	80	33	20	6579	73.10	1
4	High wage rates	1120	4154	360	159	47	40	66	20	5966	66.29	2
5	High cost of fertilizers	160	268	420	636	141	1520	495	180	3820	42.44	5
6	High cost of pesticides	80	201	360	742	141	400	1353	240	3517	39.08	7
7	Insufficient institutional credit	0	335	300	371	470	480	396	780	3132	34.80	8
8	Lack of technical knowledge	0	268	360	795	752	560	429	440	3604	40.04	6

4.17.2 Problems in Marketing of Soybean

It is always expected that marketing system must be efficient to provide necessary environment for greater agricultural production through price incentives to producer at one hand and supply of quality products at fair prices to the consumer on the other. Here an attempt has been made to study the problems faced by the soybean producers in marketing of soybean.

Table 4.20 Preference and Ranking of Problems Faced by Farmers in Marketing

Sr. No.	Problems	Rank given by the respondent				
		I	II	III	IV	V
1	Lack of storage and processing	4	66	7	5	8
2	High transportation charges	4	6	63	8	9
3	Malpractices such as unauthorized deductions	8	9	7	60	6
4	Lack of efficient marketing information system	1	3	9	12	65
5	Low prices	73	6	4	5	2

The problems faced by farmers during marketing of soybean are mentioned in Table 4.20, and it reveals that, out of 90 soybean farmers, low prices ranked as first by 73 respondents, second rank by 6 respondents and 2 respondents of them mentioned as last rank. Similarly, problem of lack of storage and processing of soybean rank as first by 4 respondents, second ranked by 66 respondent and 8 of them mentioned as last rank.

Table 4.21 Percent Position and Garret Value for Problems in Marketing

Sr. No.	100 (Rij-0.5)/Nj	Per cent Position	Garret Value
1	100*(1-0.5)/5	10	75
2	100*(2-0.5)/5	30	60
3	100*(3-0.5)/5	50	50
4	100*(4-0.5)/5	70	40
5	100*(5-0.5)/5	90	25

Table 4.22 Calculation of Garret Score and Ranking of Soybean Marketing

Sr. No.	Problems	Garret Score						%	Rank
		I	II	III	IV	V	Total		
1	Lack of storage and processing	300	3960	350	200	200	5010	55.67	2
2	High transportation charges	300	360	3150	320	225	4355	48.39	3
3	Malpractices such as unauthorized deductions	600	540	350	2400	150	4040	44.89	4
4	Lack of efficient marketing information system	75	180	450	480	1625	2810	31.22	5
5	Low prices	5475	360	200	200	50	6285	69.83	1

All problems ranked by soybean farmers are mentioned in Table 4.22 shows the problem of low prices got the first rank, followed by lack of storage and processing, high transportation charges, malpractices such as unauthorized deductions, lack of efficient marketing information system got II, III, IV and Vth rank, respectively.

5. SUMMARY AND CONCLUSIONS

5.1 Summary

The cultivation of soybean plays an important role in the economy of nation because, most of the edible oil requirement of nation is met through import. It is one of the best sources of vegetable protein and also maintains the soil health with its nitrogen fixation ability and less exhaustive growth habit. As it is well known, that India is blessed with varying agro-climatic conditions and has abundant labour force, produces practically all varieties.

The present investigation entitled, 'Economics of production and marketing of soybean in Yavatmal district of Maharashtra', was undertaken with the following specific objectives.

i. To estimate the cost of cultivation of soybean.
ii. To estimate resource use productivity and resource use efficiency.
iii. To estimate the marketing costs and marketing efficiency.
iv. To study the problems in production and marketing of soybean.

Data for the present study were collected from two tahsils of Yavatmal district *viz.*, Darwha and Digras. These tahsils were selected purposively according to area under soybean. In all six villages, three villages from each tahsil were selected randomly and from six villages, 90 soybean farmers were selected on the basis of actual area under soybean. All the 90 soybean farmers were categorized into three different groups, i.e. small (0.01 to 0.40 ha), medium (0.41 to 0.80 ha) and large (0.81 ha and above).

All the relevant data required for study purpose were collected by survey method with the help of schedules specially designed for the purpose. Collection of data were done by personal interview with the sample farmers.

Information pertaining to input utilization, marketing and constraints was collected for the year 2018-19. The per hectare cost of cultivation, marketing cost, marketing channel were worked out. For the analysis of data standard cost concepts were used. The summarized findings of this study are as follows.

The average size of family was ranged from 4.33 in small group, 4.67 in medium group and in large group it was 4.83. At overall level, average family size was 4.61.

Land use pattern of selected farmers showed that, at the overall level, total land was worked out to 2.47 ha. Out of this land, about 94.74 per cent area was operational holding, 5.26 per cent was permanent fallow while 60.90 per cent area under irrigation and remaining 30.97 per cent was unirrigated. Operational holding of small, medium and large groups was 1.50, 2.21, and 3.30 ha, respectively, which accounted 93.79, 94.75 and 95.17 per cent, respectively.

The selected farmers adopted diversified cropping pattern. In kharif season, they were cultivating crops like cotton, soybean, kharif jowar, pigeon pea, green gram, black gram, etc. Among kharif crops, cotton and soybean were major crops which combined together accounted 53.08 per cent of total gross cropped area. Among *rabi* crops wheat and gram accounted to 8.24 and 14.39 per cent, respectively. Under the fruit crops, farmers having Nagpur orange, at overall level which accounted to 2.02 per cent of gross cropped area.

The total investment, on farm implements and machinery in small, medium and large size groups worked out to ₹ 420822.66, ₹ 649576.16 and ₹ 919507.34, respectively. At overall level, it worked out to ₹ 662869.83

In case of livestock position of selected farmers at overall level, the investment on bullock pairs was ₹ 45,755.56, cows ₹ 20,644.44 and buffaloes was ₹ 11,611.11 which accounted to 52.89, 23.86 and 13.42 per cent of total investment, respectively. At overall level, the total investment was ₹ 86,507.78.

Per hectare cost of cultivation at overall level was worked out to ₹ 45588.49 while per hectare yield was 15.24 quintals indicating thereby per quintal cost of cultivation as ₹ 2993.79. The major items of the cost were hired human labour, seed, machine power, plant protection and weedicide charges, manures and fertilizers. The share of hired human labour at overall level, was 11.46 per cent of cost 'C'.

It was found that at the overall level, the per hectare yield and gross return obtained were 15.24 quintals and ₹ 53556.28, respectively. B:C ratio, in small, medium and large size groups were worked out to 1.21, 1.25 and 1.14, at cost 'C', respectively. B:C ratio at overall level, at cost 'C' was worked out to 1.17.

In case of the resource use productivities in soybean production for different size group of farms, it was observed that all nine variables *viz.*, human labour (X_1), bullock labour (X_2), machine (X_3), seed (X_4), manures (X_5), nitrogen (X_6), phosphorus (X_7), potassium (X_8), plant protection (X_9), included in the production function analysis have jointly explained 75 per cent of the total variation in the output of soybean.

At overall level 97.89 per cent of total produce was marketed. The remaining produce was used for seed and losses due to pests.

The average per quintal cost of marketing at Channel I, II and III, worked out to be ₹ 30.10, ₹ 121.0 and ₹ 93.22 respectively. The major items of the cost of marketing were the cost of transportation, cost of packing material, etc.

The price spread in Channel II was higher ₹ 570.67 per quintal, followed by Channel I and Channel III ₹ 550.82 per quintal and ₹ 512.23 per quintal, respectively. Marketing

efficiency was highest in Channel III i.e. 6.47. More the number of market intermediaries less is the marketing efficiency.

In cultivation of soybean there occurred several problems such as non-availability of labour in time, high wage rate, lack of availability quality seed, high cost of seed, high cost of fertilizers, lack of technical knowledge, high cost of insecticides and pesticides, insufficient institutional credit in time, etc. In case of marketing, majority of soybean farmers reported the following problems *viz.*, problems of low prices, followed by lack of storage and processing, high transportation charges, malpractices such as unauthorized deductions, lack of efficient marketing information system.

5.2 Conclusions

From present study, following conclusions are drawn.

1 The cropping pattern of sample farmers in Yavatmal district of Maharashtra was dominated by soybean and cotton crop and it contributed about 53.08 per cent share in GCA, which was greater than other crops.

2 There is variation in the use of resources in soybean cultivation on different size group of farms. Productivity of soybean per hectare was the highest on small size of group followed by medium and large size of groups.

3 The per hectare labour requirement for various operations on sample farms decreased with increase in size groups.

4 The B:C ratio for the sample soybean farmers is more than unity at cost 'C' level which indicates that soybean is profitable crop from producer's point of view.

5 In case of production function analysis, it is concluded that, productivity of human labour, nitrogenous, phosphatic, potash fertilizers, and plant protection have contributed greatly to the yield of soybean. The regression coefficients of all the selected variables except bullock labour were positive indicating there is a scope to increase the use of these variables for getting an advantage of increasing return to scale.

6 The resource use pattern needs to be adjusted to rationalize the soybean production function in the study area.

7 Out of three marketing channels identified Channel-III: Producer-Wholesaler- processor was found profitable from producer's point of view as producers share in consumers rupee was recorded highest. The highest marketing costs were incurred by wholesalers followed by village trader.

8 The various problems faced by the soybean farmers in the production aspects *viz*., non-availability of labour in time, high wage rate, lack of availability quality seed, high cost of seed, high cost of fertilizers, lack of technical knowledge, high cost of insecticides and pesticides, insufficient institutional credit in time, etc., need to be addressed, so as to

increase yield. Present investigation indicated that the soybean production is a profitable enterprise which needs to be encouraged by the Government agencies.

9 In case of marketing, various problems faced by the soybean farmers are, problems of low prices, followed by lack of storage and processing, high transportation charges, malpractices such as unauthorized deductions, lack of efficient marketing information system, these problems need to be mitigated to increase the net return of farmer.

5.3 Suggestions

With the results obtained from the research study, following few suggestions can be made.

i. In order to increase the productivity of soybean there is need of appropriate use of human labours, machine power, nitrogen, phosphorus, potash fertilizers and plant protection.

ii. The soybean farmers shall be provided the technical knowledge from the State Agriculture Universities (SAUs) and other extension agencies for solving the problem in the production and marketing of soybean for better income.

iii. Market information about prevalent prices in various relevant markets should be made available to the soybean farmers through modern and efficient method for timely sale of produce.

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7. APPENDIX

QUESTIONNAIRE (2018-19)

Economics of Production and Marketing of Soybean in

Yavatmal district of Maharashtra.

1. Name of Soybean Farmer:

Age**:** Education: Occupation:

Village: Tal: District:

Mobile No:

2. Family Information

Sr. No.	Name	Relation with head of family	Age (years)	Education	Occupation	Income (₹)

3. Land Use Pattern

Sr. No.	Survey No.	Total holding	Permanent Fallow	Operational Holding		Current fallow	Land Revenue	Present value
				Irrigated	Rainfed			

4. Buildings

Sr. No.	**Building type**	**Size**	**Building year**	**Present value (₹)**	**Repairing charges (₹)**	**Remaining life (years)**
1	House					
2	Farm house					
3	Cattle shed					
4	Store house					
5	Shop					
6	Other					

5. Irrigation Structure

Sr. No.	Type	Digging/ Purchasing Year	Present value (₹)	Irrigation capacity (ha)	Remaining life (years)	Repairing Charges (₹)
1	Well					
2	Bore-well					
3	Pipe line(m/f)					
4	Electric motor (hp)					
5	Diesel engine					
6	Drip/sprinkler system					
7	Other					

6. Farm Implements and Machineries

Sr. No.	Particulars	Number	Purchase year	Purchase Cost (₹)	Repairing charges (₹)	Remaining life
A	Implements					
1	Wooden					
2	Plough					
3	Iron plough					
4	Harrow					
5	Seed drill					
6	Hoes					
7	Other					
B	Machineries					
1	Tractor					
2	Trolley					
3	Rotavator					
4	Plough					
5	Harrow					
C	Bullock cart					
D	Spade					
E	Sickle					
F	Axe					
G	Other					

7. Livestock

Sr. No.	Type	Number	Age (years)	Present value (₹)
1	Bullock			
2	Cow			
A	Local			
	Milch			
	Dry			
B	Crossbreed			
	Milch			
	Dry			
C	Calves			
3	Buffalo			
A	Milch			
	Dry			
B	Calves			
C	Goats			
4	Poultry			
5	Other			

8. Cropping Pattern (2018-19)

Sr. No.	Season	Crop	Area (ha)	
			Irrigated	Rainfed
1.	*Kharif*	1 2 3 4 5 6		
2.	Rabi	1 2 3 4 5 6		
3.	Summer	1 2 3 4 5 6		
4.	Annual	1 2 3 4		
5.	Fruit crops	1 2 3 4		
6.	Vegetables	1 2 3 4 5		

Cost of Cultivation of Soybean

Area: Plot No.: I/U: Variety: Date of Sowing: Date of Harvesting:

Sr. No.	Operation	Material			Labour								Rate				Total cost
					Family			Hired			Machinery		M	F	B	Machinery	
		Name	Qty.	Value	M	F	B	M	F	B	Family	Hired					
1.	**Preparatory Tillage**																
a.	Ploughing																
b.	Harrowing																
c.	Clod crushing																
d.	Stubble Picking																
e.	Manuring																
2.	Sowing																
2.1	Seed Treatment																
3.	**Intercultural operations**																
3.1	Chemical Fertilizers																
	i)																
	ii)																
	iii)																
3.2	Weeding																
3.3	Hoeing																
3.4.	**Plant Protection**																
a.	Insecticide																

Table contd…

Sr. No.	Operation	Material			Labour								Cost				Total cost
					Family			Hired			Machinery		M	F	B	Machinery	
		Name	Qty.	Value	M	F	B	M	F	B	Family	Hired					
b.	Fungicides																
c.	Herbicides																
d.	Others																
3.5	Irrigations																
4	Harvesting																
5	Threshing																
6	Transport																
7	Others																
8	Total Cost																
9	Total Yield																

11. Marketing Channels

1. Producer -Village Trader- Wholesaler- Processor.
2. Producer – Commission Agent- Wholesaler -Processor.
3. Producer – Wholesaler – Processor.

12. Production and Disposal of Soybean

Sr. No.	Mode	Quantity	Value (₹)
1	Total production (q)		
2	Cattle Feed (q)		
3	Seed (q)		
4	Damaged Grain (q)		
5	Marketable Quantity		

13. Marketing Cost

Qty. sold	Name of market	Packaging charges	Transport cost (Total) (₹)	Tolai	Hamali	other

14. Problems in Production of Soybean

Sr. No.	Problems	Rank given by the respondent							
		I	II	III	IV	V	VI	VII	VIII
1	Lack of availability of quality seed								
2	High cost of seed								
3	Unavailability of labours in time								
4	High wage rates								
5	High cost of fertilizers								
6	High cost of pesticides								
7	Non- availability of sufficient institutional credit								
8	Lack of technical knowledge								

15. Problems in Marketing of Soybean

Sr. No.	Problems	Rank Given by the Respondent				
		I	II	III	IV	V
1	Lack of storage and processing					
2	High transportation charges					
3	Malpractices such as unauthorized deductions					
4	Lack of efficient marketing information system					
5	Low prices					

8. VITAE

Mr. RATHOD UMESH SUBHASH

MASTER OF SCIENCE (AGRICULTURE)
IN
AGRICULTURAL ECONOMICS

2019

Title of thesis		**:**	Economics of production and marketing of soybean in Yavatmal district of Maharashtra.
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	Father's Name	**:**	Mr. Subhash Sajusing Rathod
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	Class	**:**	First class
	Name of University	**:**	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.
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	e-mail id	**:**	urathod135@gmail.com
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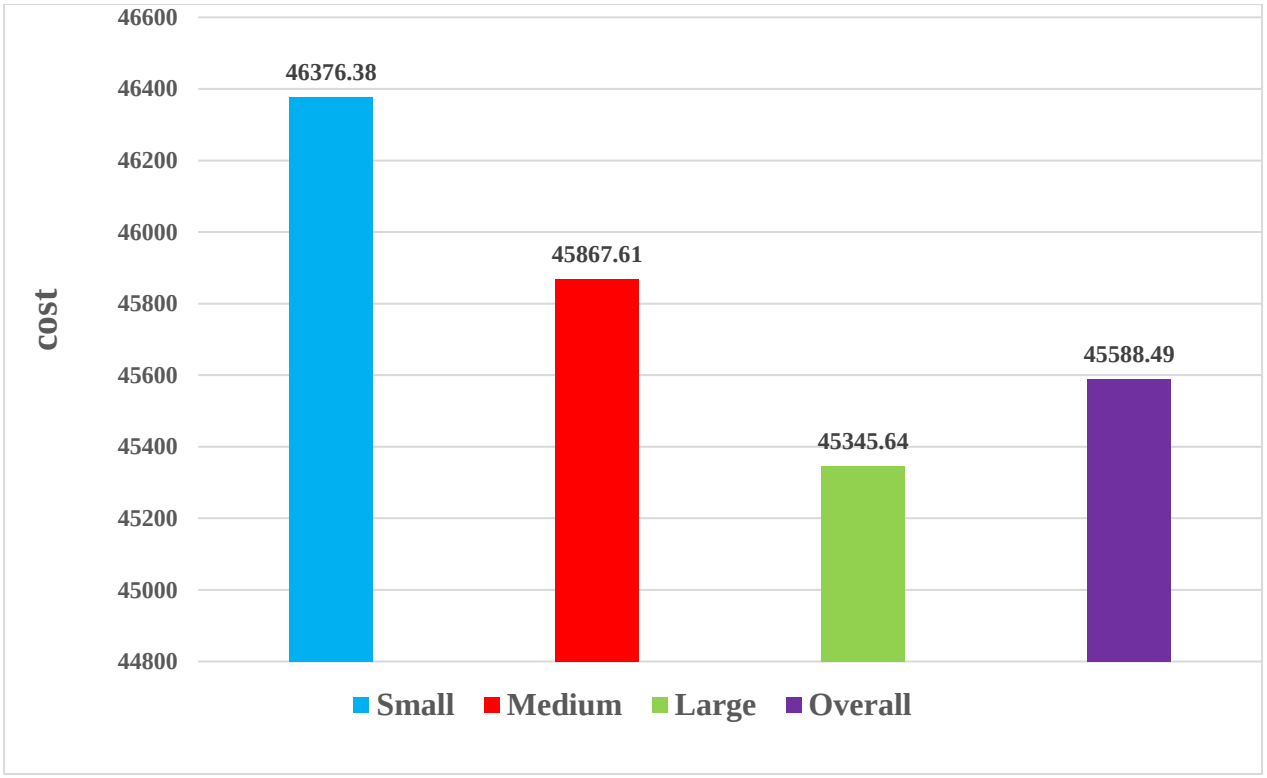

Fig. 2. Cost of Cultivation of Soybean

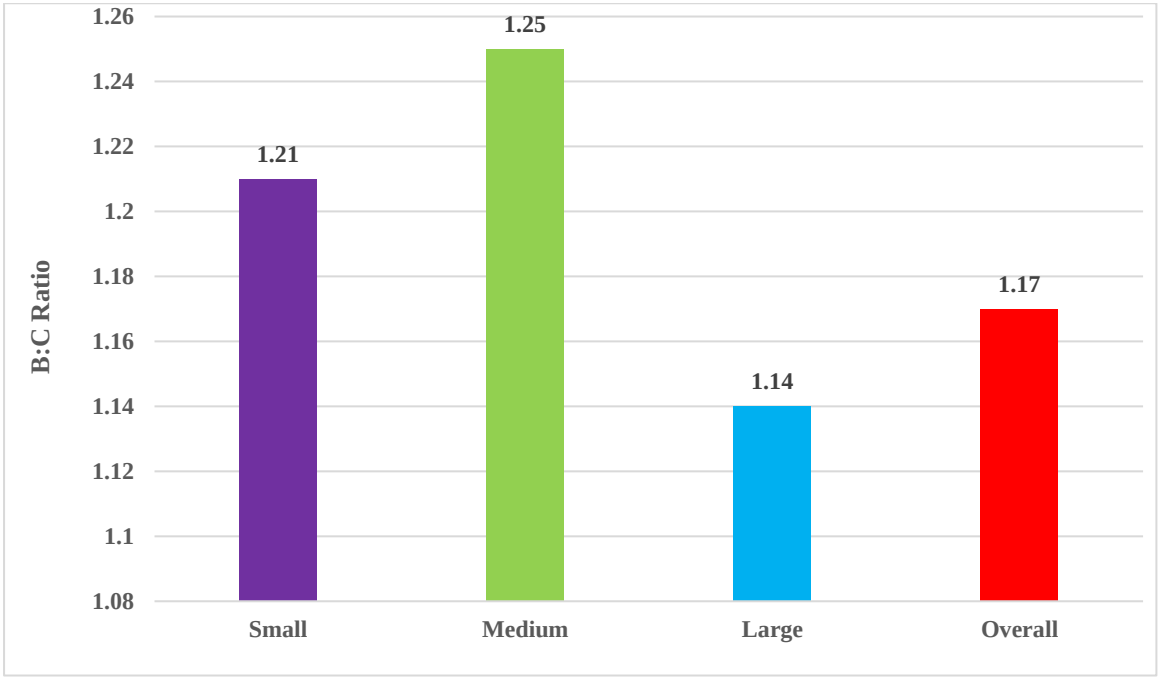

Fig. 3. B:C Ratio for Soybean

Study Area

Fig. 1. Yavatmal District

Plate 1

Healthy Plot

Name: Ramesh Rambhau Datir Place: Ladkhed
Date: 07/07//2018

Name: Madhav Sajusing Rathod Place: Khopadi
Date: 23/07//2018

Plate 2

Intercultural Operations

Name: Vijay Sajusing Rathod **Weeding** Place: Khopadi

Date: 09/07//2018

Name: Sushil Vijay Mirase **Spraying** Place: Khopadi

Date: 26/07//2018

Plate 3

Harvesting

Name: Ramesh Rambhau Datir Place: Ladkhed
Date: 13/09//2018

Name: Ramesh Rambhau Datir Place: Ladkhed
Date: 13/09//2018

Plate 4
Marketing Practices

Buldhana Urban Warehouse **Storage** Place: Darwha
Date: 02/01//2019

APMC karanja (Lad) **Market Yard** Place: karanja (Lad)
Date: 07/01//2019