Economics of soybean production in Betul district of Madhya Pradesh

THESIS

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Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

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In

AGRICULTURE

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By

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CERTIFICATE – I

This is to certify that the thesis entitled, **"Economics of soybean production in Betul district of Madhya Pradesh"** *submitted in partial fulfilment of the requirement for the degree of* **MASTER OF SCIENCE** *in* **AGRICULTURE (Agricultural Economics and Farm Management)** of *Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior is a record of the bonafied research work carried out by* **Mr. Umesh Suryawanshi** *under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instruction.*

No part of the thesis has been submitted for any degree or diploma (Certificate awarded etc.) or has been published / published part has been fully acknowledged. All the assistance and help received during the course of the investigation has been acknowledged by him.

Place : Gwalior **(A.M. Rajput)**

Date : Chairman of the Advisory Committee

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CERTIFICATE – II

This is to certify that the thesis entitled, **"Economics of soybean production in Betul district of Madhya Pradesh"** *submitted by* **Mr. Umesh Suryawanshi** *to the R.V.S. Krishi Vishwa Vidyalaya, Gwalior in partial fulfilment of the requirements for the degree of* **MASTER OF SCIENCE** *in* **AGRICULTURE (Agricultural Economics and Farm Management)** *in* **Department of Agricultural Economics and Farm Managment, College of Agriculture, Gwalior** *has been, after evaluation, approved by the External Examiner and by the Student's Advisory Committee after an oral examination on the same.*

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CHAPTER–I

INTRODUCTION

Soybean [*Glycine max* (L.) Merr.] is an important oil seed legume crop in the world. It contains about 20 per cent cholesterol free oil and 42 per cent protein, which has 2-3 times more protein yield per hectare than other legumes. Besides having such nutritive value and being a leguminous crop, it is capable of fixing atmospheric nitrogen at the rate of 85-115 kg/ha (Baldex *et al.*, 1998) with symbiosis of *Rhizobium japonicum* micro-organism after fulfillment of its requirement.

Soybean has shown tremendous growth in area and production in the country and in Madhya Pradesh, particularly during recent past. This crop has emerged as one of the prominent rainy season crop in central India and most important oilseed crop next to mustard and groundnut in India. It's cultivation is leaping down southwards in the state of Maharashtra, Karnataka and Tamil Nadu, as well as in the eastern states apart from part of Uttar Pradesh and Rajasthan adjoining to Madhya Pradesh. Having approximately 80 per cent share in national area and production of soybean, Madhya Pradesh has distinguished as 'soya-state'. Now this crop has occupied a vital place in agricultural and oil economy of India.

The total production of soybean in India and Madhya Pradesh was 60.98 lakh tonnes, during the year 2009-2010. The area of soybean in Madhya Pradesh was 55.19 lakh hectares. However, the average productivity of soybean in India and Madhya Pradesh was 1105 kg/ha, during the year 2009-2010 (SOPA, 2010).

Table 1.1: All India state wise area, yield and production of soybean during kharif (monsoon) 2008, 2009 and 2010.

(Area in lakh ha, Yield in kg per ha, Production in lakh mt.)

Name of State	2008 (*Kharif*)			2009 (*Kharif*)			**2010 (*Kharif*)**		
	Area	**Yield per ha.**	**Production**	**Area**	**Yield per ha.**	**Production**	**Area**	**Yield per ha.**	**Production**
Madhya Pradesh	51.434	1010	51.948	52.985	1040	55.084	55.193	1105	60.987
Maharashtra	30.684	925	28.383	30.320	982	29.774	26.030	1058	27.543
Rajasthan	8.524	860	7.331	7.094	859	6.094	6.920	1103	7.633
Andhra Pradesh	1.500	1040	1.560	1.810	1050	1.901	1.410	1075	1.516
Karnataka	1.990	1015	2.020	2.310	1025	2.368	1.800	1025	1.845
Chhattisgarh	1.210	875	1.059	1.290	925	1.193	1.490	1050	1.565
Rest of	0.900	865	0.779	0.900	925	0.833	0.190	1020	0.194
Grand Total	96.242	967	93.079	96.709	1006	97.246	93.033	1089	101.283

Table 1.2: Division & district wise area, yield & production of soybean during kharif (monsoon) 2008, 2009 and 2010

(Madhya Pradesh *Area in lakh ha, Yield in kg per ha, Production in lakh mt.*)

	2007-2008 Kharif			**2008-2009 Kharif**			**2009-2010 Kharif**		
Division / District	**Area**	**Yield per ha**	**Production**	**Area**	**Yield per ha**	**Production**	**Sown Area**	**Yield per ha**	**Production**
Hoshangabad Division									
Betul	1.900	960	1.824	1.910	950	1.815	1.960	1015	1.989
Hoshangabad	1.950	975	1.901	1.956	965	1.888	2.006	1271	2.550
Harda	1.640	1050	1.722	1.650	1125	1.856	1.665	1116	1.858
Total Division	**5.490**	**992**	**5.447**	**5.516**	**1008**	**5.558**	**5.631**	**1136**	**6.397**

Source: The Soybean Processors Association of India (SOPA), Indore,

Ref.: SOPA/2.11/ JSP/2010 /30, (2010).

The productivity of this crop is affected by many factors viz., crop genetics, management and climatic factors. Among the various factors responsible for the low

yield, weeds have been considered to be of prime importance. The losses caused by weeds exceed the losses from any other category of agricultural pests like insect, nematodes, disease, rodents etc. The total annual loss of an agricultural produce from various pests in India, weeds account for 45 per cent, insect 30 per cent, disease 20 per cent and other pests 5 per cent (Subramaniam *et al.,* 1995).

Severe weed competition is one of the major constraints in lower productivity of soybean. The competitional stress of weeds on crop for nutrients, water, light and space are responsible for poor yield of soybean. The weeds reduce the growth and yield of soybean upto 77 per cent (Tiwari and Kurchania, 1990).

In Madhya Pradesh, soybean is extensively grown during rainy season (*Kharif*). There is a conductive atmosphere for an excessive weed infestation upto September. The excessive occurrence of weeds limits the full expression of yield potential of this crop, thus an early control of weeds (first 30 days) in soybean is very critical and if not done, the yield losses may reach upto 43 per cent. Once soybean develops its foliage canopy and covers the ground area, it can take care of weeds, which are associated with its cultivation. So, it is obvious that the potential of soybean varieties even with adoption of improved cultivation technology involving use of all valuable inputs cannot be obtained in the absence of proper weed management and management.

The unavailability of adequate labourers during weeding peaks and use of mechanical weeder in heavy soils due to rains creates problem for effective control of weeds. Herbicidal weed control remains the only choice for farmers. Under such conditions, pre-emergence and post-emergence herbicides reduce the labourers, cost and also control the weeds effectively. Keeping this in view, the present study entitled, “Economics of soybean production in Betul district of Madhya Pradesh” is undertaken with the following objectives:

1. To study the economics of the production of soybean on the farmers field in the study area.
2. To examine the input output relationship and resource use efficiency in soybean production.
3. To identify various constraints in soybean production and to suggest measures in production of soybean.

Justification of selecting problem

Under the aegis of the All India Coordinated Research Project on oilseed, adequate technology has been generated to increase the yield levels of soybean substantially. Ever since the project came into its operation, many improved soybean varieties have been developed and released for general cultivation in different states. Recommendations are also available on the dates of sowing, spacing, fertilizer dose and plant protection schedules. When the improved technology was field tested by organizing half acre field demonstration right on the farmer fields. The yield increases were found to range from 20% in Tamil Nadu to as much as 119% in Punjab. This clearly demonstrates that the improved technology can certainly bring about substantial yield increases if popularized among farmers.

Besides soybean area is now becoming day by day less considerable in Betul district of Madhya Pradesh still it is a popular kharif crop. So, this study was chosen for calculating economics and for suggesting ideas to increase productivity and profit by growing the crop.

Limitations of the Study:

This study does not claim to be free from limitations. The major limitations of the present study are given below :

(i) The study relates to Betul district of Madhya Pradesh. Therefore, the results of this study area situation specific so also results of the study related to specific year i.e. 2010-11 (Kharif)

(ii) The empirical results are based on data reported by the respondents using recall of memory. Therefore, some memory bias may not be ruled out.

Plan of the study

Various aspects of the intended investigation to be included in the dissertation run into 7 chapters. The first chapter of the study deals with the introduction aspect of the problem viz. importance, objectives, limitation and scope of the study. In the chapter number two presented general information about the area of study and in chapter number-three review of literature is presented. Chapter number-four deals with the aspects of research methodology materials and

techniques of the analysis of field data. The results along with the discussion, constraints are described in chapter number-five. The chapter number-six includes summary, conclusion and suggestions for further work along with implication of the study. In the chapter number-seven references is presented to provide an account of the similar work done in past. The last part of the dissertation is the appendix which would throw light on the detailed observations.

CHAPTER-II

AGRO-CLIMATIC FEATURES OF BETUL DISTRICT OF MADHYA PRADESH

Betul is one of the marginally located southern districts of Madhya Pradesh, lying almost wholly on the Satpura plateau. It occupies nearly the whole width of the satpura range between the valley of the narmada on the north and the bearer plains on the south. It forms the southernmost part of Bhopal commissioners Division. The district derives its name from the small town of Betul Bazar about 5Km. south of Badnur, the Headquarters of district. During the Maratha regime as also in the beginning of the British rule, Betul or Betul Bazar was the district Headquarters. Betul is a one of the tribal population districts of M.P. This district comes under satpuda plateau and Jawar & Wheat crop zone from the point of view of agriculture climate. Geographical area is 1007.8 thousand hectare out of which 416.7 thousand hectare land is under cultivation. The Northern part of the district has a touch of Bundelkhandi language and culture. The Southern belt of the district has overtone of Marathi Language and Maharashtrian culture. The rest of the district is predominantly tribal, populated by the Gonds and Korkus. There is some institution for classical Music like, Bhatkhande Sangeet College at Betul. With abundant Food - Grain production & extensive coverage of forest wended with good Road & Rail Network, better Telecomm facilities in Betul is praised to become an industrial advanced district.

GEOGRAPHY

Betul is located at 21.92°N 77.9°E. It has an average elevation of 658 metres (2158 ft). Betul itself is the most developed place in the district and is well connected with most parts of India by railway. Betul is situated on the Delhi-Chennai main railway line and is also well connected by a network of roads. At Barsali a stone marks the Geographical Center Point of India.

The mean elevation above the sea is about 2000 ft. The country is essentially a highland tract, divided naturally into three distinct portions, differing in their superficial aspects, the character of their soil and their geological formation. The northern part of the district forms an irregular plain of the sandstone formation. It is a well-wooded tract, in many places stretching out in charming glades like an

English park, but it has a very sparse population and little cultivated land. In the extreme north a line of hills rises abruptly out of the great plain of the Narmada valley. The central tract alone possesses a rich soil, well watered by the Machna River and Sapna dam, almost entirely cultivated and studded with villages. To the south lies a rolling plateau of basaltic formation (with the sacred town of Multai, and the springs of the Tapti River at its highest point), extending over the whole of the southern face of the district, and finally merging into the wild and broken line of the Ghats, which lead down to the plains. This tract consists of a succession of stony ridges of trap rock, enclosing valleys or basins of fertile soil, to which cultivation is for the most part confined, except where the shallow soil on the tops of the hills has been turned to account.

Betul district is rich in forests and biodiversity. The main timber species of Betul Forest is Teak. Many miscellaneous types of trees such as Haldu, Saja, Dhaoda etc. are also found in abundance. Many medicinal plants are also found in the forest areas of Betul. Large amounts of commercially-important minor forest produce such as Tendu leaves, Chironji, Harra, Amla are also collected from the forests of Betul. Asia's biggest wood depot in Betul.

PHYSIOGRAPHY AND SOIL

The district has four district physiographic division viz. (i) Satpura plateau in Tawa and Morand valleys, (ii) The Satpura plateau in central, (iii) southern part of the district, and, (iv) Tapti valley. The whole district lies on Satpura plateau at an elevation of 365 m above mean sea level. The general elevation is about 609m at Kilendeo form the highest peak in the northern and central parts of the district. A Tawa valley lies at on elevation of 396 m amsl between peaks of Kilandeo and Bhogwangar, the general scope of the valley is towards the North West.

The country is mainly undertaking with presence of few residual hills and is inter sector by large number of stream joining Taw the high land mass of the district sub sides into the fringing ravenous country of Wardha and tributaries of the Kanhan. The went of Khamla is highest point 1137 m amsl in the entire country and forms the part of Gwagarh hills.

The drainage of the district is diverted in all direction from the eastern high mass of Satpura plateau. The northern and central part of the district drains into the

Narmada in the north through Tawa, Machna Morand and the Bhange. The Tapti bengh basically consequent river and flowing to the west drain water of the western and southern central part of the Purna, Mam and Wadha occupy small areas of their drainage in the southern part of the district.

In the district, there are five types of soils namely kali soil, Morand soil, Matbarra soils, Bardi soil Sihar and retard soils. The southern central and eastern part of the district is covered by black cotton soil.

AREA AND POPULATION

The District covers and area of 10043 km²and population is 13,95,175 as per 2001 census. Density of the Population is 138/km². Betul district is rich in tribal population. The tribal population of the district as per 2001 census is 5,49,907. Main tribes inhabiting the district are Gonds and Korkus. The other castes include Kurmis, Kunbis, Bhoyars, Mehras, Chamars, Banias and Rajputs. As of 2001 India census, Betul had a population of 83,287. Males constitute 52% of the population and females 48%. Betul has an average literacy rate of 76%, higher than the national average of 59.5%; with 55% of the males and 45% of females literate. 13% of the population is under 6 years of age.

Rainfall & Climate

The climate of Betul is characterized by a hot summer and general dryness except rainfall during the south- west monsoon season. The year can be divided into four seasons. The cold season, December to February is followed by hot season from March to about first week of June is the summer season. The period from the middle June to September is the south-west monsoon season. May is the hottest month of the year with average temperature of 39.3^{o}C. The minimum during the December is 10.3^{o}C. The normal annual mean maximum and minimum temperature is 30.7^{o}C and 17.9^{o}C respectively.

The south-west monsoon starts from middle of June and lasts till end of September. October and middle of November constitute the post monsoon or retreating monsoon season. The normal annual rainfall of Betul district is 1192.6 mm. About 86.6% of annual rainfall is received during monsoon season. Only 13.4% of annual rainfall takes place between October to May.

The humidity comes down lowest in April. It varies between 31 to 91% at different time in different seasons. The wind velocity is high during the monsoon period as compared to pre and post monsoon. The wind velocity is higher in June around 8.5Km/hr and lowest is 3.8 km/hr in November.

The major rivers flowing in the district are the Ganjal River (a tributary of the Tapti River), and the Morand River and the Tawa River (tributaries of the Narmada River). The Tapti River originates from Multai in the Betul district; Multai's Sanskrit name 'Multapi' means 'origin of Tapi or the Tapti River'.

The district is divided into 5 Tehsils and 10 blocks the district is predominantly a rural district there are 1343 villages. The total population of the district of as per 2001 census. The details of administrative units are given in table- 1 and fig number 1.

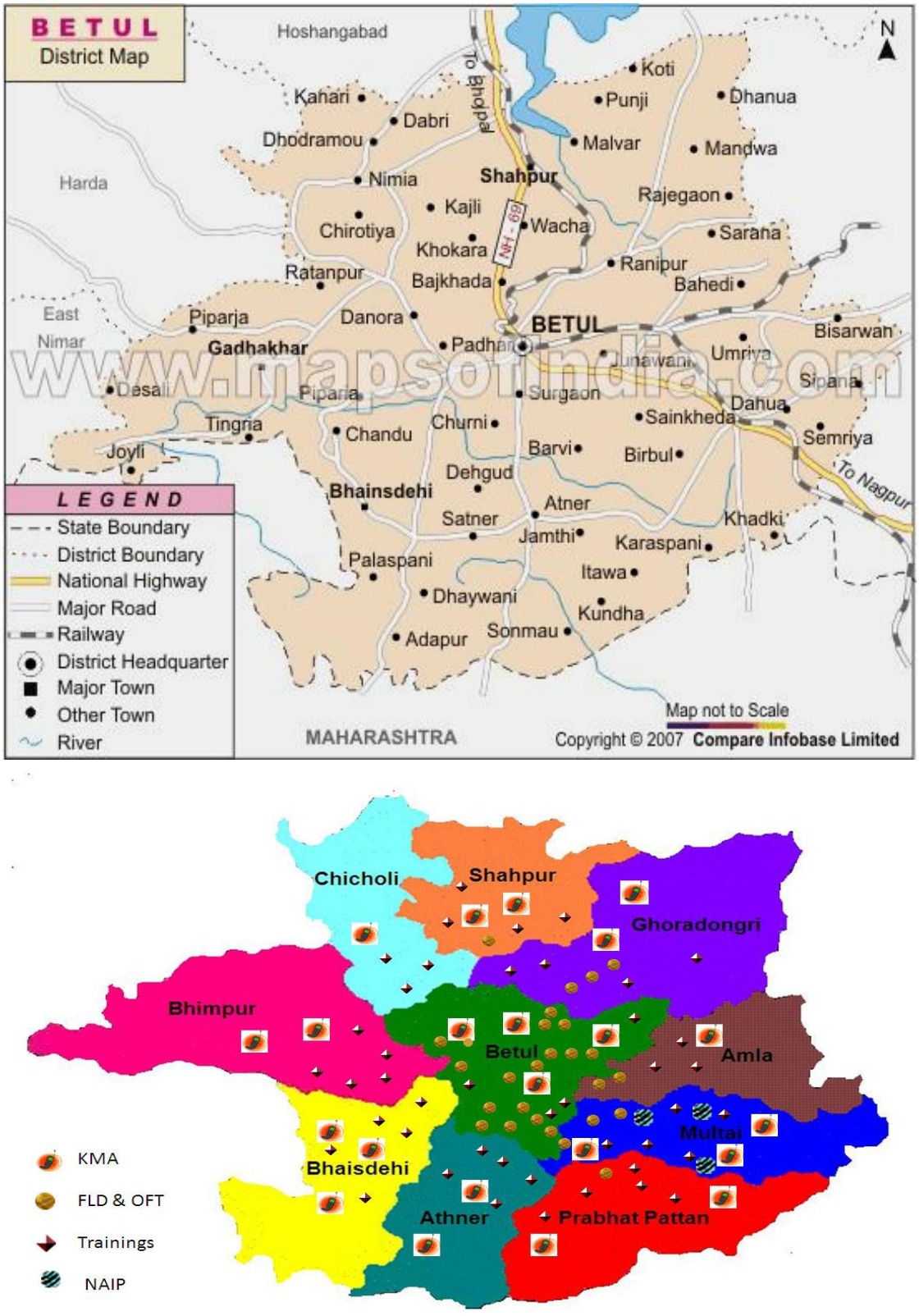

Fig 2.1: Map of Betul District in Madhya Pradesh

Table 2.1: Administrative Divisions, District Betul M.P. (Census-2001)

S. No	Blocks	Area in sq. km	No. of villages	No. of Gram	Population	Increase in 10 year	S.C. population	S.T. population

				Panchayat		in %		
1	Betul	1003.92	188	77	240160	22.37	22192	64567
2	Chicholi	431.63	80	34	73861	25.44	4030	46472
3	Ghoradongri	729.44	162	56	225307	21.41	32079	82874
4	Bhainsdehi	772.44	132	50	116761	15.42	10188	62648
5	Athner	711.95	100	45	92869	13.51	6948	41770
6	Bhimpur	936.93	151	54	122313	28.48	4663	103603
7	Shahpur	591.89	125	40	95909	22.30	7679	61770
8	Multai	807.00	132	69	143933	9.06	15599	14639
9	P Patan	921.82	120	65	122462	9.86	19154	31023
10	Amla	748.10	153	68	161600	14.79	25072	40541

LAND USE

The total geographical area of the district 1007.8 thousand hectares out of which 416.7 thousand hectare land is under cultivation and which is 47.34 per cent of total geographical area of the district. In Bhainsdehi Block total geographical area is 76007 hectare, having 59600 hectare area under cultivated land, which is 78.41 per cent of the total geographical area of Bhainsdehi Block.

CROPPING PATTERN

The principal crops in the district were wheat, millet, other food-grains, pulse, oil-seeds, and a little sugarcane and cotton. Soybean is the most important cash crop. The major kharif crops sown during the month of June-July and harvested in the month September-October are jawar, mung, urd, soybean, cotton, maize, arhar and groundnut. The main rabi crops for which sowing operation starts during October-November and harvested in March-April, which include wheat, gram, lentil, pea etc.

MAIN FEATURE OF THE SELECTED VILLAGE

The five villages selected for the present investigation are : Chicholidhana, Katol, Palaspani, Borgaon and Neempaniya. These villages are situated in Bhainsdehi block of Betul district with in a pest-phery of 15-20 km of Tehsil head quarters (Fig 2.2).

(1) Chicholidhana

It is situated 2 km from the Tehsil head quarters. Chicholidhana established near the Purna River. Population is 3263 of Chicholidhana village. Out of total population schedule caste, schedule tribe, general and other backward caste population are 71, 75, 8 and 3109, respectively. The total number of holding size in 650. In this village small, medium, large holding size are 290, 260 and 100, respectively.

Labour is depending only on the agricultural works in this village. But within years about 30 per cent labourer are gone for doing the contractor work or gram panchayat works because the earn more money in comparison to the village. In Chicholidhana village population percentage of each category is schedule tribe, schedule caste, other backward and general are 2.17, 2.29, 95.2 and 0.245 per cent, respectively.

(2) Katol

It is located 6 km from the Tehsil headquarters. It is established near the Purna River. Village Katol is situated in the well arranged streets. These are three panchayat hand pump for the drinking water and these is a middle school and Anganwadi also in the village. The total population of Katol village is 625 on the basis of 2001 census. The population of schedule caste and schedule tribe is 42 and 76 of the total population of Katol village. In term of percentage, which is 6.72 per cent schedule caste and 12.16 per cent schedule tribes. The population of Other Backward Caste 488 and in terms of percentage 78.08. The holding size of small, medium, large farmer are 125. In Katol village 4 candidates are in the Govt. services.

(3) Palaspani

It is situated 15 km distance from the tehsil headquarters. The total population of Palaspani village is 1459. In this village 3.62 per cent schedule caste, 92.32 per cent schedule tribe and 4.04 per cent other backward classes of the total population of village. The total number of holding size is 290 which are 168 small size holding, 83 medium size holding and 49 large size holding.

(4) Borgaon

It is situated 28 km distance from the tehsil headquarters. It's situated on the small hills of Satpura Mountain and Bank of Tapti River. Peasants irrigate this field through the small dam during rabi season. The population of the village 1118 of the basis of 2001 census. In Borgaon village female and male 572 of the total population, 84.97 per cent population belong to schedule tribe, 8.13 per cent schedule caste and 6.44 per cent other backwards class in this village. Peasant followed traditional farming in this village due to lack of knowledge and illiteracy total number of holding size is 220 in which 105 small size holding, 95 medium size and 20 large size holdings, respectively.

(5) Neempaniya :

It is situated 22 km distance from the Tehsil headquarters. It's situated on the small hill of Satpura mountain. The total population of village is 883 in which is 5.66% schedule cast and 85%, schedule tribes and 9.28 per cent others back ward class. The total numbers of holdings are 175 out of which is 99 small, 61 medium and 25 large holdings. The peasant doing traditional farming, due to lack of knowledge and high percentage of illiteracy in the Neempaniya village.

Above five villages are connected with Bhainsdehi Block. Three villages Chicholidhana, Katol, Palaspani are doing intensive cultivation. But two villages Borgaon and Neempaniya are doing traditional farming, due to lack of knowledge and high percentage of illiteracy.

The labourer are doing towards contractor work and gram panchayat because the earn more money in comparison to village. Therefore, farmer are facing the problem of shortage of labour in the Bhainsdehi Block of Betul district and more due to this regions, they are paying more money.

LIVE-STOCK AND IMPLEMENTS

In the study area 75 per cent farmers are use traditional implements and only 25 per cent farmer are use improved implements like seed drill, cultivator and plough. In this area farmers are generally used wooden from the Satpura Mountain for manufacturing of implements.

In this area, presents are kept dairy animals and bullock, cow, buffaloes and goats etc.

CHAPTER-III

REVIEW OF LITETRATURE

In this chapter an attempt is being made to assimilate the previous works within the framework of present study, which are helpful in interpretation of results obtained during the research. Some of the important and relevant studies done so far are reviewed below :

Madhavi *et al.* (1997) results showed significant variations due to different times of sowing and fertility levels with 1st July sowing and maximum fertility level being found superior in respect of plant height (75 DAS), total dry matter and finally grain yield. The increased plant height due to high fertility level compared to control might be due to beneficial effect of N, P and K on cell division and multiplication particularly due to the fact that, P is a constituent of nucleoprotein as observed by Koinov and Patkov (1975). The total dry matter obtained was also higher dates of sowing which was due to favorable vegetative growth, in terms of plant height as also envisaged by Goswami *et al.* (1991). The total dry matter was also under higher fertility level of 90 N + 120 P_2O_5 + 60 K_2O (kg/ha) than lower levels.

Sarawgi and Tripathi (1998) field experiment was conducted during rainy (kharif) season of 1995 at Indira Gandhi Agricultural University, Raipur. Maximum net return of Rs. 15.036/ha with 1.97 cost: benefit ratio was also recorded with 60 kg P_2O_5/ha followed by 30 kg and 90 kg P_2O_5/ha (Table 2). Further economic evaluation showed maximum return per rupee invested (Rs. 2.97) and per day return (Rs. 147.40) with 60 kg phosphorous per hectare. However, maximum return per rupee invested on phosphatic fertilizers (Rs. 27.98) was with 30 kg phosphorus/ha and it decreased with increasing level of phosphorus.

Tripathi (1999) an analysis is conducted of the cost of cultivation and returns of major pulses grown in the hill farming systems of the Garhwal hills, Uttar Pradesh, India (n=100, 1994-95). Crops covered are: urdbean (*Vigna mungo*), rajmash (*Phaseolus vulgaris*), horse gram (*Macrotyloma uniflorum*), soybean (*Glycine max*) and lentil (*Lens culinaris*). The highest net return was obtained from rajmash cultivation. Soybean and lentil were not profitable. It is concluded that scope

exists to greatly increase the production and return of pulse crops through reallocation of resources.

Pawar *et al.* (2000) studies an overall productivity level of soybean from 114 soybean growers from 6 villages in Satara district. The highest productivity was obtained on large sized farms (26.82 q/ha) and the lowest on small farms (22.55 q/ha). The cost of cultivation was Rs. 10958 per hectare at the overall level. The gross and net returns were Rs. 22200 and Rs 11242, respectively, input-output ratio for soybean cultivation worked out to 1:1.97, which indicates that soybean production is economically profitable proportion.

Tomar *et al.* (2000) study was conducted during 1985-95 in Jabalpur, Madhya Pradesh, India to determine the adequate surface drainage to upland crops, sufficient ponding of water for paddy, desirable moisture regimes for kharif crops (i.e., soybean and pigeon pea) even during dry season and favourable moisture conditions for germination of rabi crops (i.e., safflower, linseed, chickpeas and wheat) using raised (6, 9, 12 and 15 m) and sunken beds, and to evaluate the economic viability of this technology. Raised beds were planted with soybean and pigeon pea. Paddy was planted in sunken beds. All the recommended practices were followed in all crops. After 1990 onwards, soybean + pigeon pea were grown as intercrop in 2:1 ratio. In case of soybean, various rabi crops were grown in raised and sunken beds in different years. Results showed that the lowest yield of soybean was recorded in the 15 m raised bed while the highest seed yield was obtained in the 6 m raised bed. Among various sized beds, the highest yield of pigeon pea was recorded in the 6 m raised bed. In the soybean + pigeon pea intercrop, the highest yields of soybean and pigeon pea were recorded in the 6 m raised bed. The average of paddy in sunken beds over 11 years was 3033 kg/ha which is a good yield under rainfed conditions as compared to the farmers situation (average yield under rainfed 386 kg/ha and irrigated 1181 kg/ha). The highest yield for all *rabi* crops was recorded in the 6-m raised bed while the lowest yield was obtained in flat plots except during 1986-87. The highest net return was observed in paddy-chickpea and pigeon pea + soybean intercrop. The best B:C ratio was observed in the pigeon pea + soybean and paddy-chickpea cropping sequence in raised and sunken beds, respectively. These results indicate that the raised sunken bed system provided sustainability in

agricultural production and fair amount of stability in crop yields. This technology is highly suitable for the dependable high rainfall areas of deep vertisols.

Babu (2001) studied the economics of tribal farming, resources in tribal farming to obtain better returns, the changes brought in the cropping pattern, intensity of cropping and other different developmental programmes. The total cultivation cost of all crops put together on whole farm per hectare was worked out. The total costs accounted for were Rs. 5,182, Rs. 5,467, Rs. 4,982 and Rs. 5,215 for small, medium, large and all farms respectively. The net returns were highest on large farms (Rs. 2492/ha), followed by small (Rs. 1,315.49) and medium (Rs. 1,244.78) farms.

Ghosh *et al.* (2001) reported that majority of the farmers belonged to middle age category having education either up to primary level (30%) or secondary level (28%). Social participation was found to be poor as 40 per cent of the farmers had no social participation and 23 per cent had low participation in different social organization. They also reported that majority of the farmers possessed medium land holding .About 60 per cent of the farmers had medium assets holdings in terms of tools and implements. The monthly income of the farmers was found to be very low, as 47 per cent of them has income below Rs. 1000 and 20 per cent of them had income between Rs. 1000 and Rs. 2000.

Kiresur *et al.* (2001) studied paper analysis profitability and sustainability of improved oilseeds production technologies for eight annual oilseed crops, viz., groundnut, sunflower, soybean, castor, rapeseed-mustard, linseed and safflower. It also estimated the yield gaps and adoption profile. It uses data from front the demonstrations for oilseed crop, conducted at 65 centres of the All India Coordinated Project on Oilseeds (ICAR) since 1988-89. Some farm level survey results on adoption are also presented in the study. The findings indicate that there are significant productivity gaps in all the crops considered which can be bridged through focused extension efforts.

Perez *et al.* (2004) reported that in Tucuman, Argentina, during 2003-04, with reference to the maize-soybean rotation. An increase of 14% of the area cultivated with soybeans was observed in comparison with 2002-03. Three cultural techniques were used, with normal or certified seed: fertilizers and fungicides;

fungicides only for rust control; and fertilizers only. The costs of planting, maintenance and harvesting were Rs. 400-500/ha, depending on the cultural methods used. An economic study is summarized of soybean monoculture or a rotation of 1 year maize, 2 years soybeans. For the rotation, the expenditure was Rs. 553.77/ha for soybeans and Rs. 624/ha for maize, the price of soybeans was Rs. 678/t and of maize Rs. 237.52/t. The gross margins for soybean in monoculture were Rs. 907/ha over 3 years, while those for the rotation were Rs. 1192 and Rs. 1050.

Billore *et al.* (2005) conducted field experiment during 1995-2001 in Indore, Madhya Pradesh, India, to study the effect of tillage (no-tillage, minimum (2 cross-harrowing) and conventional (one deep ploughing, 2 harrowing and planking) on productivity, sustainability and energy budgeting of soybean based cropping systems - soybean (cv. JS 7105), followed by wheat (cv. Sujata), chickpea (cv. JG 218), Indian mustard (cv. Pusa bold), safflower (cv. JSF 1) and linseed (cv. R 17). Tillage did not influence the yield of soybean. Minimum tillage produced the highest yield, which remained at par with conventional tillage. A similar trend was noted with respect to soybean equivalent yield, sustainability index of soybean and yield of *rabi* crops. The sustainability yield index indicated that the minimum tillage was more sustainable in case of total productivity and remained at par with conventional tillage. The sustainability index value of soybean remained identical due to minimum and conventional tillage. In *rabi* crops, the sustainability yield index value for the conventional tillage was marginally higher than minimum tillage. Economic evaluation revealed that the minimum tillage produced significantly higher net returns, B:C ratio and high sustainable value index. Energy analysis showed that the conventional tillage consumed the maximum energy input and that was remarkably higher than minimum and no-tillage. The highest gross energy output was with minimum tillage and remained at par with conventional tillage while net energy was maximum with minimum tillage and showed non-significant differences with no-tillage. However, significantly higher energy productivity and energy use efficiency was associated with no-tillage. The highest soybean yield was recorded when soybean followed Indian mustard. The maximum soybean equivalent yield was associated with soybean-wheat followed by soybean-safflower and soybean-linseed. The sustainability yield index of soybean was maximum when grown after Indian mustard. The highest net returns were recorded with soybean-safflower that

remained at par with soybean-wheat. Energy budgeting of different cropping systems indicated that the highest energy input was with soybean-wheat. The maximum gross energy output was recorded in soybean-wheat. Soybean-safflower was the most energy efficient cropping system. However, the maximum energy productivity was noted in soybean-safflower.

Mruthyunjaya *et al.* (2005) find out reversing the declining trend in productivity of oilseeds and improving the efficiency of oilseed processing is a major challenge to the policymakers and researchers. The present study has analyzed technical inefficiencies and factors responsible for inefficiencies in production and processing of four major edible oilseeds, viz. groundnut, rapeseed and mustard, soybean and sunflower. Both primary and secondary data have been used to estimate the inefficiencies. Analysis has revealed the presence of 1/4 to 1/3 technical inefficiencies in oilseed production at the average level and even more at the farm/processing unit level along with allocative and scale inefficiencies. The combined technical inefficiencies in the oilseed sector have been found to be 1/2 to 2/3, which are enormous. If prevented/minimized, the oil production in the country could nearly be doubled. Soil quality, seed replacement and education have been found as determinants of technical efficiency in oilseed production, whereas availability of adequate raw material and higher oil recovery determine the technical efficiency in oil production. Lack of assured market for oilseeds and lack of timely and assured supply of quality seeds and raw materials for processing are some of the important factors for the poor performance of the oilseeds industry. Study has reported that the marginal return to water is one of the highest in oilseeds. Therefore, cultivation of oilseeds in irrigated land if they really compete with other crops for profitability, needs to be given due consideration.

Pandey *et al.* (2005) was reported Yield and price instability and covariate risks have been examined for major oilseeds, viz. groundnut, rapeseed/mustard, sunflower and soybean, in selected states of India using time series data. Risk behaviour and effects of price and price risk on production have been analyzed in a rational expectations framework. The study has also estimated social gains from yield and revenue insurance in oilseeds. While instabilities in yield, prices and gross return have shown mixed responses, covariate risks have increased. The results of econometric analysis have indicated that the expected prices and price risk are

important determinants of oilseeds production. Price elasticities of oilseed production have been found to vary between 0.26 and 0.88 and price risk elasticities of production between –0.006 and – 0.07 in different Indian states. The potential efficiency gains from insurance schemes based on rainfall and other meteorological variables have been estimated to be 17.5 to 43 per cent over self-insurance in oilseeds production.

Singh (2006) was reported soybean originated in China and was introduced to India centuries ago through the Himalayan routes, and also brought in via Burma (now Myanmar) by traders from Indonesia. As a result, soybean has been traditionally grown on a small scale in Himachal Pradesh, the Kumaon Hills of Uttar Pradesh (now Uttaranchal), eastern Bengal, the khasi hills, Manipur, the Naga Hills, and parts of central India covering Madhya Pradesh. Because of its high protein and oil content, and another attributes such as its beneficial effects on soil fertility, several attempts were made in the past to popularize soybean cultivation in India. However, these initiatives were far from successful, mainly because of the inadequate knowledge about its cultivation, lack of high-yielding varieties, lack of marketing, and unfamiliarity with its utilization. To deal with the country's perennial protein malnutrition due to the stagnant pulse production, fresh efforts were initiated in the mid-1960s by the G.B. Pant University of Agriculture and a Technology Pant Nagar (Uttaranchal) and the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya Pradesh), in collaboration with the University of Illinois, USA to popularize soybean cultivation in India. The preliminary trials conducted at Pantnagar in 1965-66, using soybean varieties from southern USA, yielded 3 to 4 per hectare within 110-130 days, which prompted the Indian Council of Agricultural Research (ICAR) to initiate, on 1st April 1967, an All-India Project for Coordinated Research on Soybeans. Through the well-coordinated and collaborative efforts of a number of national, international, and private sector organizations over the years, soybean has now become an important crop in India. From about 11,000 ha until 1961, soybean occupied over 6 million ha in 2003 producing over 6 million tonnes. This has made India the 5th largest producer of soybean in the world today. Among the many partners in this success story, GBPUAT played a major role in the initial phase of soybean variety improvement, soybean market development, and coordination of the national soybean research and development in India.

Ahirwar *et al.* (2007) studies Madhya Pradesh is designated as the 'Soya State' as it has major share in area (67%) and production (57%) of soybean in India. In this study, an effort has been made to examine the profitability and input use efficiency in cultivation of soybean at different size of farms in soybean producing district (Ujjain) of Malwa plateau agro-climatic zone of Madhya Pradesh which is selected purposively having maximum area under cultivation of soybean in the state. The sampling unit comprised of randomly selected 240 farm holdings (110 small, 70 medium and 60 large). The required primary data related to agricultural year 2004-05 were collected through survey method using pre-tested interview schedule. It was observed from the analyzed data that the total cost of cultivation was maximum on large (Rs 8574.80/ha) as compared to medium (Rs 8538.19/ha) and small (Rs 7680.73) size of farms revealing that soybean production involves high expenditure on purchased inputs viz., seed, fertilizers, insecticides and hired mechanical power. The maximum gross income was found on medium (Rs 13400/ha) followed by large (Rs 12969.50/ha) and small (Rs 11813.00/ha) size of farms. As far as the cost benefit ratio is concerned, it was found to be maximum on medium (1: 1.57), followed by small (1: 1.54) and large (1: 1.51) size of farms. The use of human labour showed positive and significant contributions towards yield of soybean on all sizes except large size of farms. The use of fertilizer and plant protection chemicals showed positive and significant impact on yield on all sizes of farms except large. The other factors of production did not show any positive response towards yield revealing that these factors were not used efficiently by the soybean growers or the quality of the inputs was not up to the mark. The sum of the regression coefficients indicated constant return to scale in all the category of farms. This implies that the further increase in soybean production is possible only through up-gradation of existing production technology either through seed (varietals) replacement coupled with superior inputs, balanced use of fertilizers and judicious farm management practices. This will not only enhance the input use efficiency but will also help to reduce the cost per unit of production of soybean.

Chandel (2007) studies the increased oilseed production and productivity in India has not helped out our country. The study of sustainability of production and productivity of oilseeds, its technological improvement, profitability, input growth and their efficient use. The area under six edible oilseed crop namely, rapeseed and

mustard (RSM), groundnut (GNUT), sunflower, (SUNF) soybean (SOYA) and safflower (SAFF). Per hectare production of these crops increased from 580 kg to 880 kg which is still 50-60 per cent lowers then the world averages varying from crop to crop registered a growth rate 2.2% per annum. The data from two states Madhya Pradesh and Uttar Pradesh were used to calculate IFP. These states are representative sample of soybean cultivation in India as they account for 85 per cent of the crop area in the country.

Jain *et al.* (2007) studies today, India are one of the largest producers of oilseeds in the world and this sector occupies an important position in the agricultural economy. Rajasthan state occupies a prominent place in the oilseeds production of India. The important oilseed crops of the Rajasthan state are groundnut, soybean, rapeseed & mustard, sesamum and taramira. The growth pattern of these crops in the state has been prone to risk over time and across the agro-climatic regions because of the rainfall behaviour, prolonged drought periods, limited water-resources and facilities available in the state under such a situation, growth performances of these crops are subjected to high degree of risks in the sector. Therefore, it is important to describe the growth pattern of area, production and productivity, factors affecting acreage allocation under crops and magnitude of instability as well as its sources in major oilseeds crops of Rajasthan state. The fluctuating yield has been seen for almost all the oilseeds crops. However, the area and yield instability of the mustard crop has been found declining overtime plausibly because of increase in irrigation facilities, location-specific technologies and better input management. However, this needs to be further strengthened for improvement in the overall agricultural scenario. The acreage of the crops has been found to be governed by both price and non-price factors. Hence, price incentive alone has not been found to be the sufficient in bringing the desirable change in the cropping pattern as well production of crops. Hence, a policy for better implementation of support price system, development of consistently performing varieties and further enhancement of irrigation facilities will go a long way to ensure stability in the Rajasthan agriculture. To compel the large yield variability, it is advisable to the farmers to avail benefits of crop insurance scheme.

Khadwe *et al.* (2007) conducted on the farmers fields of Chindwara district under Satpura Plateau of Madhya Pradesh during to 2004 revealed that varieties PK

1024, JS 335 and JS 80-21 yields and 78.67, 64.29 and 43.82 per cent higher seed yield as compare to local variety with traditional practices. The productivity of soybean ranged from 10.80 to 22.80 q/ha with the highest average yield to 20.55 q/ha under recommended practices. There was an increase of 55.42 to 91.16% in seed yield over local check. The demonstrations gave an additional income of Rs. 8100 to 16735/ha and 3.02 to 6.25 incremental benefit cost ratio.

Mutanal *et al.* (2008) a field experiment was conducted during 1990-2005 to know the productivity of soybean (*Glycine max* L. Merril)- safflower (*Carthamus tinctorius* L.) crop sequence in different multipurpose trees in black clayey soils under rainfed conditions at Dhar. The experiment consisted of 10 different tree species, viz., neem (*Azadirachta indica* L. Juss), rose wood *(Dalbergia latifolia* Roxzb), Khejri (*Prosopis cineraria* L.), Babool (*Acacia nilotica* L.), Nilgiri (Educalyptus tereticornix L.), Bahera *(Terminalia bellerica* Gaertn Roxb), Tamarind (*Tamarindus indica* L.) and Mango (*Mangifera india* L.) were planted at 10 m x 10 m field crops were grown in alley of trees in sequence. Yield reduction of field crop decreased with increase in growth of trees species. It as higher in safflower compared to soybean. Soybean yields were significantly higher with *P. cineraria* compared with the other tree species. Grain yield reduction was higher in *Ceiba pentandra, Dalbergia latifolia, T. bellerica* and *T. indica*. Similar, trends were observed in rabi yield of safflower. The growth of tree species as higher in *T. belleric, C. pentandra, E. tereticornis* and *C. equisetfoila* compared with the other tree species. Economic analysis indicated that benefit : cost ratio, net returns and internal rate of returns were higher in field crop + *P. cineraria* compared to other tree species.

Billore *et al.* (2009) studies the highest non-renewable energy and total energy input was associated with conventional tillage. Renewable energy to non renewable energy ratio and renewable energy percentage to total energy input were the maximum in no till. The lowest energy intensiveness was associated with minimum tillage. The gross and net energy output and renewable energy use efficiency were the maximum in conventional tillage. Soybean chickpea system had an edge over soybean-wheat in case of renewable energy productivity and intensiveness. The application of organic manure either alone or in conjunction with mineral fertilizer significantly increased the renewable energy share while just reverse with lone application of mineral fertilizers. The integration of organic and

inorganic source of nutrients production highest energy outputs. The highest renewable and non renewable energy use efficiency was recorded with recommended dose of fertilizer and poultry manure alone respectively. Application of recommended dose of fertility showed the highest renewable energy productivity. The integration of organic manure with recommended dose of fertilizer showed higher energy intensiveness than their lone application of organic manure.

Jain (2009) reported the field experiment entitled, “Conjunctive use of fertilizers and manures in soybean-wheat sequence” was conducted during 2003–04 and 2004–05 in RBD comprising of 16 treatments (8 treatments only chemical fertilizers and 8 conjunction of fertilizers and manures), each treatments replicated thrice. The studies on growth and yield attributing characters, grain and stover/straw yields and economics as affected by different treatments were conducted. The uptake of nutrient (NPK) by soybean under various treatments was also determined. Grain yield data revealed that maximum yield in soybean (1823 kg/ha in 2003 and 1952 kg/ha in 2004) was attained in case of 50% RDF through fertilizer+ 5 t FYM/ha applied to each crop and in wheat (6113 kg/ha in 2003–04 and 6049 kg/ha in 2004–05) was recorded in treatment 75% RDF in soybean and 100% RDF in wheat trough chemical fertilizers. The minimum grain and straw yield in both the crops was noted in control. The net realization/ha and C:B ratio in different treatments indicate that 50% of RDF through fertilizer along with 5 t FYM/ha given to each crop provided good monetary return (Rs. 40899) and C: B ratio (2.90). In situation of availability of only chemical fertilizers, 75% of RDF to soybean crop and 100% RDF to following wheat crop which provided net return of Rs. 40922/ha. The minimum net returns (Rs. 27174/ha) and C:B ratio (2.45) was noted in control.

Patel *et al.* (2009) studies soybean was introduced in India for cultivation during seventies of the twentieth century. India with 6.5 million hectares of soybean area and 7.86 million tonnes of production ranks fifth in the world. There are number of reasons for non adoption of improved practice of soybean cultivation. A research was conducted in two blocks of Kabirdham district by personally interviewing 10 randomly chosen soybean growers. Most of the respondents experienced various constraints like lack of training, non-availability of information at proper time, lack of technical knowledge, lack knowledge about proper dose of insecticide, fungicide, weedicide etc. Some of the major suggestion given by the soybean grower were

knowledge should be increased in various aspects of soybean production technology i.e. seed treatment, rhizobium culture, improved Varity and use of proper dose of fungicide, insecticide etc. through systematic skill oriented training programme.

Ramesh *et al*. (2009) a field experiment was conducted during rainy (kharif) and winter (Rabi) seasons of 2004-08 to study the effect of different combination of organic manures involving cowdung manure, poultry manure and vermi compost vis-à-vis recommended doses of fertilizers and control on the yield potential, soil fertility and economics of soybean (*Glycine max* (L) Merr.), chickpea (*Cicer arietinum* L.) and blond psylium or isabgol (*Plantago ovate* Forsk) in deep Vertisols of central India. The mean of 4 year data indicate that the highest soybean seed yield (1069 kg/ha) was obtained with the application of cowdung manure 4 t/ha resulted in the highest seed yield (1766 kg/ha) which was at par with the yield obtained by the recommended dose of fertilizers (1693 kg/ha). Isabgol seed yield was the highest (1291 kg/ha) with the combined application of cowdung manure 1 t/ha + vermin compost 0.7 t/ha + poultry manure 0.5 t/ha, which was superior to the yields obtained with the recommended dose of fertilizers (1153 kg/ha). The seed quality of these crops was at par with the treatments receiving either organic manures or chemical fertilizers but was significantly superior to the control. At the end of the fourth cropping cycle, combined application of cowdung manure + vermi-compost + poultry manure resulted in the improvement of soil organic carbon content, available soil N, P and K compared to either recommended dose of fertilizers or control. Soybean chickpea recorded the highest gross returns (Rs. 43927), net returns (Rs. 23890) and benefit: cost ratio (2.19) compared to the soybean isabgol cropping system. Combined application of cowdung manure+ vermin compost + poultry manure resulted in the highest gross returns (Rs. 45008), net returns (Rs. 24786) and benefit: cost ration (2.22) compared to either chemical fertilizers or the control.

Rekha and Dhurua (2009) a field experiment was conducted during *kharif* seasons of 2002, 2003 and 2004 to study the effect of planting pattern and duration of pigeon pea varieties on productivity of pigeon pea + soybean intercropping system under rainfed conditions. The highest seed yields were recorded by sole crops of pigeon pea (1401 kg/ha) and soybean (1853 kg/ha). Planting of pigeon pea, Durga

at 90 cm with 1 row of soybean and pigeon pea MRG-66, 150 cm with five rows of soybean recorded maximum net returns of (Rs. 17,226/ha) and (Rs. 22,035/ha) respectively. Pigeon pea, MRG-66 at 180 cm with six rows of soybean recorded maximum (1.39) land equivalent ratio.

Nadani Devi (2010) reported soybean is consumed by every household in Manipur in the form of fermented soybean as a tradition from time immemorial. Soybean was grown in an area of about 820 ha with a production of 615 tonnes during 2008-09. The productivity (750 kg/ha) was quite low as compare to the national average (1000 kg/ha). Thus, there is a need to identify the high yielding genotype suitable under Manipur condition to bridge the demand supply gap. Looking into this view, cultivation of soybean genotypes JS 97-52, Bragg, RAUS-5 and JS 335 were carried out at different location under real farm situations of the stated from kharif 2005 to 2007. The trials were carried out under All India Coordinated Research Project on soybean, central Agricultural University, Imphal. Maximum number of pods per plant (40) was obtained from the variety JS 335 (1284 kg/ha). The optimum plant population for JS 335 was found to be 0.4 million per hectare. From the economic point of view the maximum net return (Rs. 3814/ha) and B:C ration (2.12) were obtained from the variety JS 335 as compare to other varieties tested under Manipur condition.

Tomar and Sawarkar (2010) seventy two front line demonstrations on farmer's field on soybean crop wise conducted under NATP project by Zonal Agricultural Research Station Chhindwara (M.P.) during 2001-2003. The specific objective of these FLD'S was to demonstrate improved technology (HYV JS – 335, 20:80:20 NPK kg/ha plant protection measure) to moderate farming community for obtaining highest yield. Results revealed that 17.18 q/ha yield and profit of Rs. 11208/ha was obtained through improve technology, which were highest 35.62 per cent in yield and Rs. 3924/ha more in net profit than 13.12 q/ha yield obtained by the use of untreated old seed of variety JS-335 and 7.20 NP Kg/ha (farmers practices)

CHAPTER – IV

MATERIAL AND METHODS

METHODOLOGY MATERIAL AND TECHNIQUES

Research methodology has been designed to suit the main objectives of the study. This study on, “Economics of Soybean production in Betul district of Madhya Pradesh” is specially undertaken with the main objectives to examinee the cost structure and profitability and identify various constraints in soybean production in Betul district. The district was selected for its major contribution towards the area under soybean in Madhya Pradesh. Betul district comprises 10 blocks, out of which Bhainsdehi block was selected randomly by lottery method. The research methodology used in the study is presented under three groups viz., selection, collection of data and analysis of data.

SELECTION OF VILLAGES AND SOYBEAN CULTIVATORS

Betul district has been divided into 10 blocks, out of which Bhainsdehi block was randomly selected using lottry method. For the selection of villages a list of all the villages was prepared firstly. Then five villages were selected randomly from 149 villages of Bhainsdehi Block for the purpose of study. In this way this study is related only five villages of Bhainsdehi block.

SELECTION OF SOYBEAN GROWING FARMERS

The class limits were depending according to lower and upper limit of net cropped area in each village separately. The list of farmers of each of the villages was prepared in ascending orders according to size holding. All the farmers of each village were divided into three groups i.e. small (0-2 ha) medium (2.1-4 ha) and large (4.1 ha and above) holding. The total numbers of sample farmers were selected sixty.

Table 4.1: Showing numbers of units selected for different size groups from five villages

Size Group	Villages					Total
	Chicholidhana	Katol	Borgaon	Palaspani	Neempaniya	
Small (0-2 ha)	12	3	4	7	4	**30**
Medium (2.1- 4ha)	11	1	4	3	2	**21**
Large (above 4ha)	4	1	1	2	1	**9**
Total	**27**	**5**	**9**	**12**	**7**	**60**

COLLECTION OF DATA

For this study, data were collected from primary and secondary source. The secondary data on area, yield and production of soybean in states and districts were recorded from Agriculture situation in India, statistics of Madhya Pradesh Directorate of Economics and Statistics, Bhopal, Indian Council of Agriculture Research in Brief, ICAR and Hindu Survey of Agriculture Chennai while primary data was collected from selected formers through personal interview.

For the collection of Primary data a number of different schedules and performers were prepared. Now the schedules were framed by arranging the questions systematically. In preparing, such schedules the objectives of study taking few farmers. Suitable modification and recasting were made wherever it was necessary while farming questions due consideration was given to factors such as language, consciousness, comprehensiveness etc.

ANALYSIS OF DATA

The data so obtained were thoroughly checked for consistency and the data gap if any. Having checked the data all the information were summarized on master sheets to have a clear bird’s eye view of the data before subjecting them to further classification and analysis.

COST OF CULTIVATION

Cost Includes the following variables: human labor, bullock labour, machine hours, seed, fertilizers, manure, watching, interest on working capital, depreciation, land revenue, rental value of owner land, family labour and transportation charges.

COST ITEMS

1. Value of human labour
2. Value of owned bullock labour
3. Value of hired bullock labour
4. Value of owned machine labour
5. Value of hired machine labour
6. Value of owned seed
7. Value of purchased seed
8. Value of owned farm yard manure
9. Value of purchased farm yard manure
10. Value of fertilizers
11. Land revenue
12. Watching charge
13. Interest on working capital
14. Depreciation
15. Miscellaneous expenses
16. Rent for leased in land
17. Interest on fixed capital (excluding land)

18. Rental value of owned land

19. Value of family labour

COST CONCEPT

Cost A_1=

1. Value of human labour
2. Value of owned bullock labour
3. Value of hired bullock labour
4. Value of owned machine labour
5. Value of hired machine labour
6. Value of owned seed
7. Value of purchased seed
8. Value of owned farm yard manure
9. Value of purchased farm yard manure
10. Value of fertilizers
11. Land revenue
12. Watching charge
13. Interest on working capital
14. Depreciation
15. Miscellaneous expenses

Cost A_2 = Cost A_1+ Rent for leased in land.

Cost B_1 = Cost A_2+Interest on owned fixed capital (excluding land)

Cost B_2 = Cost B_1+Rental value of owned land

Cost C_1 = Cost B_1+Imputed value of family labour

Cost C_2 = Cost B_2+ Imputed value of family labour

Cost C_3 = Cost C_2+10% Cost C_2 as managerial cost

$$\text{Cost of production (Rs/ha)} = \frac{\text{(Total cost-value of by product) Rs/ha}}{\text{Main production (q/ha)}}$$

Gross Income = Total value of main product + by product

Farm business income = Gross income - Cost A_1

Family labour income = Gross income - Cost B_2

Net farm income = Gross income - Cost C_3

$$\text{Benefit Cost Ratio} = \frac{\text{Gross income}}{\text{Total Cost}}$$

INTEREST ON WORKING CAPITAL

It was calculated at the rate of 6 percent of the amount for six months. Rental value calculated 6 percent of gross income.

CHAPTER – V

RESULTS AND DISCUSSION

This chapter deals with the results obtained through analysis of collected data and discussion of various findings related to the objectives of the study. The area allocation decision and choice of crop to grow in a field depend upon the prices, yields and inputs used in the cultivation. Therefore, profile of sample respondents, the place of soybean in the cropping pattern, cost of cultivation, gross income, net income and family labours income, cost of production per quintal soybean of the selected farmers were analyzed and explain in this chapter

Economic characteristics of the selected farmers

This profile includes various socio-economics consideration to identify the socio-economic status of the average farmers of different size groups in the area under study. This includes age, education, size of family, occupation, and land utilization pattern of the farmers of different size of farms.

Age

The farmer as a manager and decision-maker plays an important role under the situations of risk and uncertainty and hence age of the farmer has a great importance in the decision making. It is therefore, important to have an idea about the age of the soybean producers. The distribution of the selected farmers according to age and different size of farms is given in Table 5.1 and shown graphically in Fig 5.1.

The data revealed that on an average the maximum soybean growers are of old age group (40%), followed by middle (37%) and young (23%) age groups. Similar, trend was observed among different size of farms except small and large farms. It is interesting to note that young age soybean producers were very few on all size of farms indicating migration of youngster towards other jobs in urban area after seeking better education.

Table 5.1: Distribution of respondents according to their age

S. No.	Categories	Size of farms			Overall
		Small	Medium	Large	
1.	Young (up to 25 years)	8 (27)	4(17)	2 (22)	**14 (23)**
2.	Middle (26 to 40 years)	13 (43)	5 (24)	4 (45)	**22 (37)**
3.	Old (41 years and above)	9(30)	12 (57)	3 (33)	**24 (40)**
Total		**30 (100)**	**21 (100)**	**9 (100)**	**60 (100)**

Figures in parenthesis are percentage to total sample in each size of farms

Education

The data on education of the sample respondents are presented in Table 5.2 and shown graphically in Fig 5.2. The data show that a majority (32%) of soybean growers having education level up to primary, followed by middle school (24%), high school (18%) However the percentage of illiteracy was observed 13% in the study area. More or less similar trend was observed for different size group of farmers.

Table 5.2: Distribution of respondents according to their education status

S. No.	Categories	Size of farms			Overall
		Small	Medium	Large	
1.	Illiterate	5 (17)	3 (14)	0 (0)	**8 (13)**
2.	Primary	12 (40)	7 (33)	0 (00)	**19 (32)**
3.	Middle	4 (13)	7 (33)	3 (33)	**14 (24)**
4.	High school	5 (17)	2(10)	4 (45)	**11 (18)**
5.	Above high school	4 (13)	2 (10)	2 (22)	**8 (13)**
Total		**30 (100)**	**21 (100)**	**9 (100)**	**60 (100)**

Figures in parenthesis are percentage to total sample in each size of farms

Type and size of family

Family size plays an important role in determining the a variable of human resource. This is also true regarding adoption of new technology pertaining to pre harvest and post harvest handling of agriculture produces. The data related to family size is presented in Table 5.3 and shown graphically in Fig 5.3. The data indicate that percentage of soybean producers having individual family system (63%) was

dominating on medium and large size groups. Whereas, small farm size group, percentage of joint family was observed more than small and medium size.

Table 5.3: Distribution of selected farmers according to their type of family

S. No.	Type of family	Size of farms			Overall
		Small	Medium	Large	
1	Individual family	18 (60)	14 (67)	6 (67)	38 (63)
2	Joint family	12 (40)	7 (33)	3 (33)	22 (37)
	Total	30 (100)	21 (100)	9 (100)	60 (100)

Figures in parenthesis are percentage to total sample in each size of farms

Occupation

The majority of the selected farmer's occupation is and their percentage in total worked out of 100 per cent agriculture for their livelihood. Crop husbandry was the main occupation found in the study area (Table 5.4 and Fig 5.4). while 65% farmers are engaged in secondary occupation like dairy, poultry, shop, private services, labour etc. None of the farmer is engaged in the enterprise related to soybean processing in the study area. It was also observed that with the increase in farms size, a decreasing trend in the number of farmers engaged in secondary occupation was seen. Maximum percentage of small farmers i.e.70% engaged in secondary occuation for earning extra money for their daily life.

Table 5.4: Distribution of respondents according to their occupation

S. No.	Occupation	Size of farms			Overall
		Small	Medium	Large	
1	**Main-** Agriculture farming	30 (100)	21 (100)	09 (100)	60 (100)
2	**Secondary-** Dairy/Poultry/Shop/Private /Services/Labour etc.	21 (70.00)	14 (66.66)	4 (44.44)	39 (65.00)

Figures in parenthesis are percentage to total sample in each size of farms

PLACE OF SOYBEAN IN TOTAL CROPPED AREA OF THE SELECTED FARMERS

The total cropped area was 179.60 hectare in which 152 hectare area occupied by soybean, when examined in terms of percentage; it ranks first, which was 84.64 per cent of total cropped area. Sorghum and Arhar occupied second and third place with 6.23 and 4.89 per cent of the total cropped area, respectively. Soybean was grown by small, medium and large size groups and the area under thus crop was 42.6, 63.0 and 74.0 ha, respectively. In terms of percentage the area occupied by small, medium and large groups of farmers was 87.55, 87.93 and 87.936 per cent of the total cropped area, respectively. (Table 5.5 and 5.6)

Thus it can be concluded that relatively area under soybean of large size group (4.1 to above) was more than the small (0-2) and medium (2.1 to 4) size group of farmers.

PRACTICES AND INPUT USE PATTERN

Soybean was grown in kharif season and mostly cultivated as unirrigated crop in Betul district. It is taken as sole crop mostly.

Table 5.5: Cropping pattern of sample farmers (2010-2011)

Crop	Area (in ha)	Percentage of the total cropped area
Soybean	152.0	84.64
Arhar	11.2	6.23
Maize	8.8	4.89
Sorghum	6.2	3.46
Chilli	1.4	0.78
Total	**179.60**	**100.00**

Table 5.6: Area under soybean of selected holdings (2010-2011)

Size group	Total cropped area (ha)	Area under soybean (ha)	Percentage area of soybean in the total cropped area
Small 0-2	42.6	37.3	87.55
Medium 2.1-4	63.0	55.4	87.98
Large 4-1- above	74.0	59.3	80.94
Over all	**59.86**	**50.66**	**85.47**

FIELD PREPARATION

Land of Bhainsdehi block is partial plain so cultivation during not season helps to keep down the soil borne disease and was prepared from deep ploughing and harrowing was followed by 2 to 3 cross harrowing. After ploughing was done after the harvest of rabi season crops and subsequent ploughing were done till field preparation sowing was done in rows.

MANURE AND FERTILIZERS

Nutrient requirements of soybean crop are quite medium and the application of fertilizers and organic manures is considered essential to obtain net returns and high yields. The requirement of nutrient will depend on soil type of region. Studies conducted in different agro climatic regions indicate that area was comparatively little efficient than Diamonium phosphate for soybean.

Table 5.7: Average input utilization of each size groups farmers (per ha) basis

Size group	Seed (kg/ha)	FYM (kg/ha)	Fertilizer (kg/ha)	
			Urea	DAP
Small 0-2	83.10	2301.44	25.46	40.21
Medium 2.1-4	76.71	2439.6	21.66	41.51
Large above 4.1	72.00	2740.30	26.13	48.90
Over all	**77.27**	**2493.80**	**24.41**	**43.54**

The result of sample farmers presented in Table 5.7 shows that the overall use of farm yard manures was 2493.80 kg/ha. It was more on small size and less on other size groups of holding. It varied from 2301.44 to 2740.30 kg/ha. The medium and large size group farmer purchased farm yard manures outside of farm. The overall cost of manure in soybean was Rs. 831.18/ha. When examined in turn of percentage to total cost, the cost of manure was 6.10 per cent of total cost. The study reveals that over all use of urea 24.41 kg/ha and Diamonium phosphate was 43.54 kg/ha. In case of the medium size group farmer's average urea was 21.66 kg/ha, which was less than overall use of fertilizer. In case of small size group and large size group it was 25.46 and 26.16 per hectare, respectively, which was also more than over all use of urea.

The study reveals that over all use of Diamonium phosphate was 43.54 kg/ha. In case of small size group it was 40.21 kg/ha, which is less than over all use of Diamonium phosphste similarly. In case of medium size farmer, it was 41.51 kg/ha, which is less than over all use of this fertilizer and in case of large size group

it was 48.90 kg/ha which is more than the overall use of the fertilizer. The cost of fertilizes was 4.13 per cent of total cost [Fig 5.7(a) and 5.7(b)].

SOWING AND SEED RATE

In Bhainsdehi block sowing was usually started from end of June to 15 July depend on the moon soon. About 70-80 kg seed are required for sowing per/ha of soybean. Results of the sample farmer are presented in the table number 5.7 shows that the overall use of seed was 77.27 kg/ha. The cost of seed in soybean was 1647.25/ha, which was at most when in terms of percentage it was examined to total cost, the cost of seed was 12.09 small size farmers was use more seed than the overall seed rate. But medium and large size groups farmers were use required quantity seed, due to their knowledge.

Sowing was wise the help of behind the tiphan or seed drill. Generally small and medium size group farmer was use tiphan for sowing of soybean. Seed of soybean for soybean cultivation the small and medium size with some large size group farmer home produced seed was used. Some large size group farmer was purchased in the Bhainsdehi market. The variety “JS-335”,which was mostly popular in this region. Some farmer preferred the new variety like “Soniya”.

IRRIGATION

Soybean mostly grown in the kharif season. In kharif season, soybean does not require irrigation, however during dry spell, irrigation may become necessary.

DISEASE PEST AND PLANT PROTECTION MEASURES

Soybean is affected by a number of disease and pests. Some disease can be avoided by sowing disease free seed, sowing into pathogen free soil. The most common disease are :

1. **Fungal disease**

    Damping off or seedling rot

    Root root

    Leaf spot

    Downy mildew

2. **Viral disease**

    Yellow mosaic

    Bud blight

INSECTS

Soybean is attacked by numerous pests all over India. The major insects are leaf miner, stem borer, gurdal bettle, Bihar hairy caterpillar, white fly and aphid are serious pests of soybean in many parts of the India and causes yield loss. In the region of soybean is damaged several times due to wide spread of disease and lack of control measures.

The result of the farm level survey show the overall cost of plant protection measure was 1565.11 Rs/ha. In case of small group size the cost of plant protection measure was 1357.40/ha, which is less to the overall cost of the plant protection measures but in case of medium size group the cost of plant protection measures was equal to the overall cost of plant protection measures. In case of the large size group the cost of plant protection measure was 1762.28/ha, which was more than the overall cost of the plant protection measures. The cost of plant protection measure was 11.49 per cent of the total cost.

WEED CONTROL

Weed problem was also serious in the soybean crop due to frequent rainfall. The causes of serious damage by weed, in standing crop of heavy competition with macro- and micro-nutrients and sun light.

It was done by manual labour or through chemicals. In the region of Bhainsdehi block all size group farmers apply the chemicals for uprooting weeds but some small and medium group size uproot the weed through manual labour.

Beside the cultural method of weed control (tillage, intercropping, dora and supplemented by hand weeding) application of herbicides such as Imarzethaper at the rate of 625 ml /ha and Targa super 650ml/ha spray can effectively control the weed in Kharif crop in the region.

The cost of the manual labour has been included in the cost of Hired labour and the cost of herbicides included in cost of pesticides. So the cost of pesticides was increased.

COST STRUCTURE

COST ITEMS

Cost of cultivars per hectare of soybean in Bhainsdehi block of Betul district for three size group of holding in the year 2010-2011 is presented in Table 5.8 and Fig 5.8.

The overall cost of cultivation per hectare of soybean was Rs. 13616.55. Out of total cost, about 28.77 per cent was in covered on Machinery and hired human labour, i.e. 15.17 and 13.60 per cent, respectively. Rest 41.42 per cent was on fertilizer, seed, bullock labour, Rental value of land, and manures the relative share of each items was 4.13, 12.09 4.82, 14.28, and 6.10 per cent of the total cost, respectively. The percentage share of family labour and interest on working capital was 9.76 and 4.64 per cent of the total cost. In case of large size group farmers, the family labour cost was less than the small and medium size group farmers, this is because very few large farmers were used family labour on their farms.

Table 5.8: Cost Structure of Soybean (2010-11)

Particulars	Small	Medium	Large	Overall
Hired human labour	1586.27 (11.93)	1649.09 (13.03)	2323.10 (15.57)	1852.82 (13.60)
Bullock labour	1020.10 (7.67)	581.58 (4.59)	369.30 (2.47)	656.99 (4.82)
Machine labour	1666.06 (12.53)	1882.02 (14.87)	2649.24 (17.76)	2065.77 (15.17)
Cost of seed	1732.43 (13.03)	1583.03 (12.51)	1626.30 (10.90)	1647.25 (12.09)
Cost of insecticides and pesticides	1357.40 (10.21)	1575.65 (12.45)	1762.28 (11.81)	1565.11 (11.49)
Cost of manure	767.07 (5.77)	813.14 (6.42)	913.34 (6.12)	831.18 (6.10)
Cost of fertilizer	534.58 (4.02)	527.79 (4.17)	624.95 (4.19)	562.44 (4.13)
Interest on working capital @ 6%	646.07 (4.86)	600.28 (4.74)	649.14 (4.35)	631.83 (4.64)
Depreciation @ 4%	114.53 (0.86)	128.02 (1.01)	1285.53 (8.61)	509.34 (3.74)
Land revenue	20 (0.15)	20 (0.15)	20 (0.13)	20 (0.14)
Rental value of land @ 5%	1759.57 (13.24)	1915.45 (15.14)	2159.85 (14.48)	1944.95 (14.28)
Family labour	2084 (15.68)	1372.52 (10.85)	530.52 (3.55)	1329.25 (9.76)
TOTAL	**13288.08**	**12648.05**	**14913.55**	**13616.55**

Note: Figure in Parentheses indicate percentage to the total of small, medium, large and overall farmers

Share of the seed in total cost was high because the high price of improved variety used by the large size group. In case of small size group cost of seed was high due to use of higher quantity of per hectare seed.

Total cost of cultivation of soybean during the year 2010-11 for medium and large size group farmers were estimated to Rs. 12648.05 and 14913.55, respectively. Hence, there is significant difference between the cost of cultivation of medium and large size group of farmers. The cost of cultivation for small size group farmers, which was Rs 13288.08 was equal to the overall cost of cultivation where as cost of cultivation for large size group farmers was estimated by 14913.55 significantly higher than the overall cost of estimated by 13616.55 The cost of cultivation of soybean for medium size group farmers was estimated 12648.05, which was the lowest than the large, small and overall size group farmers (Table 5.8).

The cost of cultivation of soybean for small size group of farmer was estimated Rs. 13288.08, which were equal to the overall cost because the small size group farmer used higher quantity of seed and engaged minimum hired human labour.

In case of medium size group of farmer the cost was estimated Rs 12648.05, which was the lowest of till the three size group farmers and also less than the overall cost.

The structure of cost was also same, except the value of family labour, hired human labour, bullock labour, depreciation, machine power and interest on working capital. The value of family labour was less in large size group farmer and highest in the small size group farmer, because they engaged themselves on the farm during the crop season. Whereas, in case of large size group farmers family labour cost (530.52) was estimated low and high (2084) in the small size group farmer. There were family labour cost 15.68 per cent of total cost in small size group farmers and 3.55 per cent in large size group farmers respectively. On the large size farms, hired labours are doing work for getting wages, but on the small and medium size farms, family labourer were doing work for saving the money and time. The

value of machine power (12.53% total cost) was low in the case of small size group farmer and 5.2 per cent more (17.76% total cost) was in large size group farmers. Due to adopting mechanized farming ,it was observed higher machine cost in case of large size group in comparison to small group farmers, and Depreciation cost was 7.75 per cent more (0.86% total cost) than the small size group farmers and 7.60per cent more than the medium size group farmers.

Cost of land revenue of own land for three size groups of farmers were paid 0.15, 0.15 and 0.13 per cent of total cost of small, medium and large size group farmers respectively.

The result of sample farmers presented in Table 5.8 shows that the overall cost of manure was estimated Rs. 813.18, in term of percentage 6.10 of the total cost. The cost of the manure (5.77% of total cost) was low in the case of small size group's farmer and 0.35 per cent more (6.12% of total cost) was in large size group. In case of medium size group the cost of manure 6.42 per cent of total cost. In case of large size group of farmer's plant protection measures cost was 1.60 per cent more (11.81% of total cost) than the small size group farmers and 0.64 per cent less than the medium size group farmers. The plant protection measures cost was high (11.49 per cent of overall cost) because due to the costly herbicide and insecticide.

4.02, 4.17 and 4.19 per cent of total cost of fertilizer of small medium and large size group farmers, respectively. Cost of fertilizer was found approximately same in three size group farmers.

Cost of cultivation of soybean for small size group was estimated Rs. 13288.08/ha, which was equal to the overall cost of cultivation Rs. 13616.55/ha. Land revenue, interest on working capital, cost of manure and fertilizer was low and value of family labour, bullock labour, seed, plant protection measure and machine power were found more in small size farmers. The use of family labour was more on small size of farms and low on medium and large size farms due to adopting of mechanized farming by the large and medium size farmers in medium and large size farms. The use of inputs such as fertilizers and manures were more in medium and large size group farmers. But cost of fertilizers of medium group was low comparatively small size group farmers, due to more use of quantity of fertilizer in

small size group farmers. Cost of seed also calculated high in small size group's because use of more seed quantity per hectare. So the cost of seed was higher in small size group farmers than the medium and large size group farmers.

Overall operation wise cost was found Rs. 5288.95/ha. In case of small group size operation wise cost was found Rs. 5998.48/ha, which was more than the average of operation wise cost but in case of medium size group the operation wise cost (Rs. 4735.17/ha) was less than to the average of cost operation wise cost. In case of the large size group the operation wise cost was Rs. 5133.25/ha, which was more and equal the average operation wise cost. The data on operation wise cost of sample respondent are presented in Table 5.9 and shown graphically in Fig 5.9 Cost of tillage and harvesting operations were high than the other operations. Operation wise cost was found low in medium size group due to use of insecticide and pesticide in soybean labour cost was reduced.

Table 5.9: Operation wise labour cost of Soybean production (2010-11)

Particulars	Small	Medium	Large	Overall
Tillage (ploughing, harrowing and leveling)	1324.66	950.90	1186.36	1153.97
F.Y.M.(transportation and spreading)	286.32	257.76	275.21	273.09
sowing	889.19	917.14	1247.55	1017.96
Inter culture	561.39	284.29	311.46	385.71
Plant protection	247.72	240.43	344.01	277.38
Harvesting	1220.58	1125.63	1153.45	1166.55
Transportation	403.75	243.14	159.86	268.91
Threshing	360.32	354.15	305.56	340.01
Watching	704.55	361.73	149.76	405.34
TOTAL	**5998.48**	**4735.17**	**5133.25**	**5288.95**

Cost concept

The cost items grouped under cost A_1, A_2, B_1, B_2, C_1, C_2 and Cost C_3 meaning of various costs.

Cost A_1 = All actual expenses in cash and kind incurred in production by owner.

Cost A_2 = Cost A_1+ Rent for leased in land.

Cost B_1 = Cost A_2+Interest on owned fixed capital

Cost B_2 = Cost B_1+Rental value of owned land

Cost C_1 = Cost B_1+Imputed value of family labour

Cost C_2 = Cost B_2+ Imputed value of family labour

Cost C_3 = Cost C_2+10% Cost C_2 as managerial cost

$$\text{Cost of production (q/ha)} = \frac{\text{(Total cost-value of by product) Rs/ha}}{\text{Main production (q/ha)}}$$

Gross Income = Total value of main product + by product

Farm business income = Gross income - Cost A_1

Family labour income = Gross income - Cost B_2

Net farm income = Gross income - Cost C_3

$$\text{Benefit Cost Ratio} = \frac{\text{Gross income}}{\text{Total Cost}}$$

Table 5.10: Cost A1 of Soybean production (2010-11)

Particulars	Small	Medium	Large	Overall
Hired human labour	1586.27	1649.09	2323.1	1852.8
Bullock labour(Own + hired)	1020.1	581.58	369.3	656.99
Machine labour (Own + hired)	1666.06	1882.02	2649.24	2065.8
Cost of seed(Home produce + purchased)	1732.43	1583.03	1626.3	1647.3
Cost of insecticides and pesticides	1357.4	1575.65	1762.28	1565.1
Cost of manure (Home produce + purchased)	767.07	813.14	913.34	831.18
Cost of fertilizer	534.58	527.79	624.95	562.44
Interest on working capital @ 6%	646.07	600.28	649.14	631.83
Depreciation @ 4%	114.53	128.02	1285.53	509.34
Land revenue	20	20	20	20
Watching charges	704.55	361.73	149.74	405.34
TOTAL	**10149.10**	**9722.33**	**12372.90**	**10748.10**

The result of sample farmers presented in table 5.10 and Fig 5.10 shows that average cost A_1 was found Rs. 10748.0/ha. It was more than the small size and medium size groups of holding. It varied from Rs. 10149.06/ha to Rs. 12372.95/ha. In case of small size groups cost A_1 was estimated Rs. 10149.06/ha and medium size group it was estimated Rs. 9722.35/ha. In case large size group cost A_1 was calculated Rs. 12372.95/ha and it was found more than the small and medium size groups due to more cost was found of machine and insecticide .

The overall cost A_1 and A_2 accounted Rs. 10748.0/ha i.e., 69.68% of total cost. The cost of B_1 and B_2 were estimated Rs. 10748.0/ha and Rs. 12693.07/ha, respectively. In terms of percentage, 69.98 and 82.29% of total cost, respectively. The cost C_1 accounted 78.30% of total cost. The cost C_2 was observed Rs. 14022.09/ha (90.90% total cost) and Rs. 15423.99/ha cost C_3 was estimated overall of the farmer. In case of small and medium it was estimated Rs. 15391.89/ha and Rs. 14311.35/ha, respectively and in large size group cost C_3 was estimated Rs. 16569.64/ha. In case of medium size group cost C_3 less than small and large size group's farmer (Table 5.11 and 5.12 and Fig 5.11 and 5.12).

Gross income from soybean during the year 2010-11 for large size group farmers was estimated 35997.54/ha, which was higher than the overall gross income. It was due to higher production in comparison to other size group of farmers. In this group cost of cultivation per hectare (Rs. 16569.64) was higher than the overall cost of cultivation.

Net farm income was estimated 19427.90 Rs/ha, comparatively higher than the average, due to following two reasons, first one was higher production and second one was higher cost of cultivation to average size group farmers per hectare and on large size farms hired labourer are doing work for wages, but small and medium size farms, family labourer were doing work. Farm business income was estimated Rs. 23624.59/ha which was also higher than other size groups (Table 5.13 and Fig 5.13).

Table 5.11: Yield and Gross income of soybean on sample farmers (2010-11)

Size group	Grain yield (q/ha)	Value @ 2150 Rs/ha	By product (q/ha)	Value @ 78 Rs/q	Gross income (Rs/ha)
Small 0-2	13.6	28079	15.99	1247.22	29326.23
Medium 2.1-4	14.20	30530	17.94	1399.32	31924.32
Large 4.1 to above	16.02	34443	19.93	1554.54	35997.54
Over all	**14.42**	**31017.33**	**17.88**	**1400.36**	**32416.03**

Table 5.12: Per hectare Cost (A1,A2,B1,B2,C1,C2 and C3) of Soybean 2010-11

Size group	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Small 0-2	10149.06	10149.06	10149.06	11908.63	12233.06	13992.63	15391.89
Medium 2.1-4	9722.35	9722.35	9722.35	11637.80	11094.87	13010.32	14311.35
Large 4.1 to above	12372.95	12372.95	12372.95	14532.80	12903.47	15063.32	16569.64
Over all	**10748.00**	**10748.00**	**10748.00**	**12693.07**	**12077.25**	**14022.09**	**15423.99**
Percentage	**69.68**	**69.68**	**69.68**	**82.29**	**78.30**	**90.91**	**100**

Gross income from a soybean during the year 2010-11 for small size group farmers was estimated as Rs. 29323.23/ha, which was lower than the average gross income. In this group cost of cultivation Rs. 15391.89/ha was also lower than overall cost of cultivation. Net income Rs. 13934.34/ha and farm business income Rs. 19177.17/ha was lower than the overall size group farmers. Family labour in income Rs. 17417.60 was also less than the average family labour income of all size group of farmer due to high cost of cultivation and low production of soybean than the other size group of farmers.

Gross income from soybean during year 2010-11 for medium size group farmer estimated Rs. 31924.32 and net income Rs. 17612.97/ha, which were more than the average. It was lower production of soybean than the large size group farmer due to lack of maintenance. Cost of cultivation for medium group farmer was estimated as Rs. 14311.35/ha which was lower than the other size group of farmers. Farm business income Rs. 22201.97/ha was higher due to total cost of cultivation medium size group was found lower. Family labour income Rs. 20286.52 was less than the large size group of farmer.

An overall view of result presented here reveal that cost of cultivation of soybean varied between Rs. 15391.89 /ha to 16569.64 Rs/ha with an average of Rs. 15423.99/ha. The most important items of the cost were seed, hired human labour, machine power and rental value of land which contributed about 55.14 per cent of total cost. The seed alone contributed alone 12.09 per cent of the total cost. The remaining 19.45 per cent cost was calculated of bullock labour, family labour, depreciation, Interest on working capital etc. there was very less expenditure in land revenue.

The average cost of production was Rs. 962.20/q. The average cost of soybean production was found Rs. 15423.99/ha. In small size group farmer the number of family labourer were higher than the medium and large size group of farmer. It is due to lack of income of small farmers. Average net income, average gross income and average cost of production, B:C ratio of soybean was found Rs. 16931.73/ha, Rs. 32416.03/ha, Rs. 962.20/q , 1:2.1, respectively in the study area.

CONSTRAINTS IN SOYBEAN PRODUCTION

1. LACK OF TECHNICAL KNOWLEDGE

"Lack of Technical Knowledge" was faced by maximum farmers due to high percentage of illiteracy.

2. COSTLY SEED

It was also expressed by farmers they purchased seed of "Sonia" variety was costly. Therefore small size group farmers were used home produce seed. Maximum medium and large group size farmers preferred "Sonia" variety through local agent. Therefore cost of cultivation was increased of farmers.

3. LACK OF CO-OPERATION

Agriculture state department does not able to provide healthy seed to all farmers at reasonable price and timely and also unable to control and measure of various disease and insect i.e. yellow mosaic, harry caterpillar and Girdle bettle.

4. NO SOIL TESTING LABORATORY FACILTY AVAIBLE

There is no soil testing laboratory in near by block to test soil nutrients for farmers. As a result the farmers were unaware of the balanced dose of nutrients required in soybean crop production.

5. MIGRATION LABOURER

Since last few years the labourer are going to the Maharashtra state for better opportunities in the industries or for sugarcane harvesting during the harvesting period as wages are higher in Maharashtra state. Therefore farmers are facing the problems of labour in the study area which is compelling them to pay higher wages to labourers.

6. USE OF COSTLY HERBICIDES AND PESTICIDES

In the study area farmers are using costly herbicides and pesticides for effective weed and insect control, and due to use of costly chemicals cost of soybean cultivation was increased.

7. WEED PROBLEM

The study area is suffering from serious weeds problem which is increasing day by day and farmers are using chemicals for weed control and therefore cost of cultivation was increased.

8. COSTLY AND UNAVAILABILITY OF FERTILIZERS

The major complaints of farmers are that the desired fertilizers are not easily available in the market and in cooperative societies therefore farmers are facing problems of costly fertilizers in the market.

9. LACK OF CAPITAL

Lack of Capital is an important constraints faced by every group of farmers.

10. SEED PROBLEM

It is also observed that farmers are not getting good quality of improved variety seed at the time of sowing.

11. MARKET PRICE FLUCTUATION

It was also extracted from farmer's views, which were disclosed during contact with them that market price fluctuations are common and major problem in Betul and Bhainsdehi Mandi. Therefore price of product was very low at the time of harvesting. Thus farmers would not be able to get appropriate market price of their produce (Fig 5.14).

CHAPTER - VI

SUMMARY, CONCLUSION &POLICY INTERPRETATIONS

IMPORTANCE AND THE OBJECTIVES

Soybean is the major oilseed crop in world accounts for 50% of the total area as well as production. It provides approx 60% of vegetable protein and 30% of oil in the world. In 2003-04, palm oil and soybean were major contributors accounting for 36 and 21% of total consumption of oil in the country.

Having approximately 80 per cent share in national area and production of soybean, Madhya Pradesh has distinguished s “Soya-State” now this crop has occupied a vital place in agricultural and oil economy of India.

After achieving a breakthrough of the production of major cereal crops. Suggestions have been diverted towards the progress of oil seeds farming in the country

Hence, there is acute need from various sectors for data on cost, returns and constraints with their remedial measures. The present study was conducted in Bhainsdehi Block of Betul district of Madhya Pradesh with the following objectives.

1. To study the economics of the production of soybean on the farmers field in the study area.
2. To examine the input output relationship and resource use efficiency in soybean production.
3. To identify various constraints in soybean production and to suggest measures in production of soybean.

METHODOLOGY

Already Betul district had been selected for the study and Betul district comprises to blocks out of which Bhainsdehi block was selected randomly for this study. Bhainsdehi block is divided in 149 villages out of which 5 villages selected from the total number of villages. A list of soybean cultivars was prepared of 5 villages and they were arranged according to size of holding viz. small (0-2 ha), Medium (2.1-4 ha) and large (above 4.1 ha) groups of farmers, and 60 farmers in all were selected randomly under proportional scheme. Now, in this way 30 farmers

were taken into small holdings size, 9 farmers were taken into large holding size group, on the basis of their farmers holding size number. Thus, the present study has accounted total 60 farmers from Bhainsdehi Block of Betul district, in Madhya Pradesh. The holding data collected were analysed using tubular method to achieve the stated objectives of the study.

The main findings of the study area as follows

The total cropped area of the sample farmers were 179.60 hectare in which area occupied by soybean was 152 hectare, when examined in terms of percentage it ranked first among the crops accounting for about 84.64 percentage of the total cropped area. The area of soybean as percentage to the holding size group ranged from 37.3 per cent in small size group and 59.3 per cent in large size group.

The average use of FYM was 2493.80 kg/ha. It was more the small size group of holding and equal to the medium size holding. The large size group of holdings uses FYM more than the average use of FYM. The medium and large size group holders purchases FYM from outside. The cost of manures in soybean was 813.14 Rs/ha. It was 6.10 per cent of the total cost.

The average use of Urea was 24.41 kg/ha and Diamonium phosphate was 43.54 kg/ha with increases in the size of holdings, the per hectare use of Diammonium phosphate was increased. But use of Urea was less than average use of Urea in case of medium size group and in case of small and large size group; use of urea was higher than the average use of Urea. The average cost of fertilizers in soybean was Rs. 562.44/ha. It was 4.13 per cent of the total cost.

In Bhainsdehi Block farmer use home produce seed. Approximately 70 per cent farmers use about 70-80 kg seed per ha are required. The cost of seed was 1647.25 Rs/ha. It was 12.09 per cent of the total cost.

The crop was stacked by mainly yellow mosaic, Dumping off and Gurdal bettle. The result of farm cost level survey shows overall cost of plant protection measure was Rs. 1565.11/ha. It was 11.49 per cent of the total cost.

An over view of results revealed that cost of Hired human labour, and family labour was Rs. 1852.82 and Rs. 1329.25/ha, respectively. It was 13.60 and 9.76 per cent of total cost, respectively with increase in the size of holdings; cost of

Hired human labour was increased. Because the more use of hired human labour, large size holdings cost of family labour was decreased.

The cost of bullock labour and machine labour was Rs 656.99 and Rs 2065 per hectare, respectively. In term of percentage, 4.82 and 15.17 per cent of the total cost, respectively.

An over view of results revealed that cost of soybean varied between Rs. 15391.89/ha to Rs. 16569.64/ha, with an average of Rs. 15423.99/ha. The most important items of the cost were seed hired human labour, machine labour, cost of insecticides and pesticides, cost of manure and fertilizers, and rental value of owned land which contributed about 76% of the total cost. The remaining 24 per cent cost was calculated of bullock labour, family labour, depreciation and interest on working capital. There was found very less expenditure in seed treatment and land revenue.

The average cost of production was found Rs. 962.20 per quintal. The overall gross income average net income and B:C ratio were estimated Rs. 32416.03/ha 16991.73/ha and 1:2.1 , respectively.

The gross income for large size group Rs. 35997.54/ha and medium & small size group were Rs. 31924.32/ha and 29326.23/ha, respectively.

CONCLUSION

Soybean crop has an important place of the study region and covers about 84.64 per cent of the total cropped area and it ranks first. Sorghum and Arhar was found in second and third rank respectively. The use of chemical fertilizers like single super phosphate and the use of seed treatment chemicals was not used according to the recommendation and also not using of sulpher in the study area , it is due to lack of knowledge and illiteracy. The average cost of cultivation of soybean was 15423.99 Rs/ha and average net returns was estimated 16991.73 Rs/ha.

The other important constraints in soybean cultivation are identified for instance no availability of good variety of soybean seed, weed problem, un availability of soil testing laboratory, shortage of labour market price fluctuation and involvement of various malpractices in the market.

SUGGESTIONS FOR FURTHER WORK

1. The farmers should use the available resources (input and labour) in most efficient and effective manner.
2. The yield per ha can be increased by performing farming operations at the proper time and proper utilization of the resources in the farmer's field.
3. Agriculture co-operative seed marketing society for soybean should be work in view of providing good quality of seed for farmers. Such co-operative societies have worked for other crop also. Efforts should be made by government for agriculture co-operative seed marketing society for soybean to come forward. So farmers could enable good quality of seeds from these societies.
4. Reasonable support price should be announced by state government in the interest of the farmers which are facing of low marketing price. It should be liability of government to provide storage facilities to producers, so that they can store their produce for reasonable profit.
5. During the marketing of produce various services are involved and charges are made for them which reduce the share of producers in selling price. Thus to check this common drawback government should either provide transport facilities at subsidy rates or established marketing co-operative societies under effective control of government. In hilly regions government such type of experimented schemes in view to reduce the transportation charges of producers. It may be excellent factor to reduce transporting charges which make a heavy charge in marketing cost.
6. Effective step should be taken for providing facilities of standardization grading and weighing which may be helpful in checking malpractices during the marketing and farmers can be escaped from cheating.
7. State agriculture department of any other government agency should be authorized by government to provide the seed of latest high yielding varieties either on subsidy or credit basis, because it was observed during study that there are many such famers who could not grow high yielding varieties due to lack of finance.
8. Farmers should be guided from time to time to check the attack of various diseases (damping off) and gurdal bettel of authorized agency of government.

9. Soil testing facility should be available to all farmers for testing soil nutrients through government of Madhya Pradesh.
10. Farmers should be adopting the mechanized farming to some extent initially, which would help them in saving time and solution of labour problems.
11. Government should adopt a well planned scheme to enhance the soybean production, keeping in view future needs of cereals, oil and pulse production.
12. Farmers should adopt weedicides for effective weed control in the study area and Government agricultural workers should guide them about the use of weedicides.
13. Training facilities should be provided about advanced techniques of cultivation to farmers by nearest agriculture research centre or Agriculture College.

REFERENCES

Ahirwar, R. F., Nahatkar, S.B. and Sharma, H.O. (2007). Profitability and Input Use Efficiency in Cultivation of Soybean in *Malwa* Plateau of Madhya Pradesh. *JNKVV, Res.J* 41 (1): 82-87.

Babu R.S.; Narender (2001). Cost and return of whole farm approch on tribal agriculture in Khammam District of Andhra Pradesh. *Andhra-Agril. J. 48(3&4) p. 303-306.*

Baldex, B., Rajmanyan, S. and Jain, H.K. (1998). Pulse crop. *Oxford and IBH publishing* Co. Pvt. Ltd., p.- 55.

Billore S.D., Ramesh A., Joshi O.P. and vyas, A.K., (2009) energy budgeting of soybean based cropping system under various tillage and fertility management. Indian J. of Agril Sci. 79 (10) p 827-

Billore, S.D., Ramesh, A., Joshi, O.P. and Vyas, A.K. (2005). Influence of tillage operations on sustainable production of soybean based cropping systems. *Soybean Res*., **3**: 17-22.

Chandel, B.S. (2007). How sustainable is the total factor productivity of oilseeds in India. Indian J. of Agri. Econ. **62** (2).

Choudhary, Anil K., Yadav, D.S. and Singh, Amar (2009). Technological and extension yield gaps in oilseeds in Mandi district of Himachal Pradesh. *Indian Journal of Soil Conservation (India)*, **37**(3) p.224-229.

Choudhary, Anil K.; Yadav, D.S.; Singh, Amar (2009) Technological and extension yield gaps in oilseeds in Mandi district of Himachal Pradesh, *Indian J. of Soil Cons.* 37(3) p.224-229.

Ghosh souvik, Kanan. K., Singh R. and Kundu D.K.(2003)socio economic profile and cropping pattern in canal command are in khurda district of orissa. *Indian J. extn. edun. 38(1&2):99-103*

Jain M.P. and Sharma A.K. (2009) Conjunctive Use of Fertilizers and Manures in Soybean-wheat Sequence *Indian J. of Dryland Agril. Res. and Development 24(1)*

Jain, P.K., Singh, I.P. and Kumar Anil (2007). Risk in output growth of oilseeds in the Rajasthan State: A policy perspective. *The paper draws heavily from the Ph.D. thesis of first author submitted under guidance of the second author to Rajasthan Agricultural University, Bikaner.* [1] Division of Agricultural Economics, IARI, New Delhi. [2]Rajasthan Agricultural University, Bikaner.

Khandwe, R., Sharma, R.C. and Pannase, S.K. (2007). Impact of recommended technologies on the yield and economics of soybean on farmers fields in Satpura Plateau Zone of Madhya Prades. *JNKVV, Res.J* 41 (1): 72-74.

Kiresur, V.R., Rao, S.V. Ramana and Hegde, D.M. (2001). Improved technologies in oilseeds production – An assessment of their economic potentials in India. *Agril. Eco. Res. Review*, **21**(1): 65-68.

Madhavi, P., Ramaiah, N.V., Satyanarayana, V. and Vijay Kumar, B. (1997). Importance of different times of sowing and fertility levels on growth and yield of soybean. *Journal oilseeds Res.* **14**:(1) 109-110.

Mruthyunjaya,Kumar,S.,Rajashekharappa,M.T.,Pandey,L.M.,Ramanarao,S.V.,and Narayan P. (2005). Efficiency in Indian edible oilseed sector Analysis and implications. Agricultural Economics Research Review. **V.18,** Issue (2).

Mutanal S.,M., Patil S.I., APtil H.,Y. Shahapurmath G., maheshwarappa V. (2009) grown and productivity of soybean and s628.afflower under different tree species and safflower under different tree species Indian J. of Agril Sci 79 (10) P 625-

Pandey L.M., Kumar Sant, Mruthyunjaya (2005) Instability, supply response and insurance in oilseeds production in India *Agril. Econ. Res. Review 18 (1)*

Patel, M.K., Shrivasrava, P. and Sarkar, J.D (2009). Constraints analysis in adoption of recommended soybean production technology. *Journal of Interacademicia (India)*, **13** (2) p.224-231.

Pawar, N.D., Patil H.N. and Bosale T.G. (2000) Economics of soybean cultivation in western maharashtra : a case study. *J. of Maharashtra Agril. universities. **25**(1): 52-54.*

Perez, D. Devani, M. Fandos, C. Mazzone and L. Soria, F. (2004). Economic analysis of the soybean season 2003-2004. Advance Agro-industrial, 25(1): 28-31.

Ramesh, P., Panwar, M.R. and singh A.B. (2010) crop productivity, soil fertility and economics of soybean, Chicle pea, and Blond Psyllium under nutrient management practices, Indian under Nutrient management practices, Indian J., of Agril, Sci 80 (11) P-965-967

Rekha M. Sree and Dhurua S. (2009). Productivity of pigeonpea + soybean intercropping system as influenced by planting patterns and duration of pigeonpea varieties under rainfed conditions. Legume Research - An International Journal V. 32, Issue :1.

Sarawgi, S.K., Tripathi, R.S. (1998). Yield and economics of Soybean (*Glycine max L.* Merril) varieties in relation to phosphorus level. *Journal oilseeds Res.* **15**:(2) 363-365.

Singh, B.B (2006) Success of soybean in India The early challenges and pioneer promoters *Asian Agri-History (India), . 10(1) p. 45-53.*

SOPA (2010). *The Soybean Processors Association of India, Indore*, Ref.: SOPA/2.11/JSP/2010/30.

Subramanian, S., Mohammed Ali, A. and Jaya Kumar, R. (1995). *All about weed control. Kalyani Publishers*, New Delhi – 2.

Tiwari, J.P., and Kurchania, S.P. (1990). Survey and management of weed in soybean (*Glycine max* (L.) Merrill) ecosystem in M.P. *Indian J. Agric. Sci*., **60**(10): 672-676.

Tomar, R.P.S. and Sawarkas, S.D. (2010). Evaluation of productivity and profitability of improved technique on Soyabean under Anshandhan Patrika **25**: (2,3, & 4) 128-130.

Tomar, S.S., Tembe, G.P. and Sharma, S.K. (2000). Productivity and economic analysis of raised sunken bed technology for increasing agricultural production in black soils of Central Madhya Pradesh. *JNKVV Research Journal*, **33**(1&2): 25-33.

Tripathi, R.S. (1999). Pulses in the hill farming system of Garhwal Himalaya: an economic approach. *Indian J. Pulses Res*., **12**(2): 221-226.

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