CULTIVATION OF MEDICINAL AND AROMATIC CROPS AS A MEANS OF DIVERSIFICATION IN AGRICULTURE IN MADHYA PRADESH

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PREFACE

The present study has been assigned by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India to some the Agro-Economic Research Centers of the country under the coordination ship of Institute for Social and Economics Change, Bangalore (Karnataka). This Centre took up this study for Madhya Pradesh State.

The present study was conducted by Dr. H.O. Sharma, and Dr. N. Khan, Research Officers of this Centre who planned the study design, conducted field investigation, tabulation and analysis and drafted the report. Study based on field data collected from selected 100 farmers (50 from Isabgol and 50 from Lemongrass) and the significant observations were recorded.

The answer of the question "Is the cultivation of medicinal and aromatic crops is the means of diversification?" is in affirmative side that yes the cultivation of medicinal and aromatic crops is the real means of diversification of agriculture. As even after facing many problems in production and marketing of medicinal and aromatic crops and got less profit or losses in production of these crops, the producers did not returns back to the production of traditional crops (paddy and wheat). But they jumped over more remunerative crops like cumin and colius in the area under study. As the cultivation of these crops improved their cropping intensity, power of decision making and gave more orientation towards their socio-economic development.

I wish to express my deep sense of gratitude to the officials of the Directorate of Economics and Statistics, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, New Delhi.

On behalf of the Centre, I express my deep sense of gratitude to Dr. D. P. Singh, Hon'ble Vice-Chancellor, Dr. V. S. Tomar, Director Research Services and Dean (Faculty of Agriculture) , Dr. C. B. Singh , Director Extension Services , Dr. J.S. Raghu, Dean, The Head of the Departments and other officials of J.N. Krishi Vishwa Vidyalaya, Jabalpur for providing guidance and help at various stages in successful completion of this study of high importance.

I extend my heartfelt thanks to the coordinator of this study Dr. R.S. Deshpandey, , Head Agricultural Development and Rural Transformation, Institute for social and economics Change, Bangalore (Karnataka) Economics Research Centre, Delhi who provided necessary guidelines for conducting this study.

I am very thankful to the states and districts level staff of the departments of Agriculture, Horticulture, Madhya Pradesh, Dean, College of Horticulture , Mandsour, Deputy Director (Horticulture), Mandsour and Jabalpur (M.P.) for providing not only secondary data but also helping in collection of field data from the selected farmers.

I am very thankful to Dr. N.L. Idnani, Dr. J.P Tiwari, Dr. V.K. Agrwal, Dr. A. B. Tiwari, Dr. Hari Patidar with all the scientists and supporting staff members of Agro-Economic Research Centre and Department of Agricultural Economics deserve to be complemented for their untiring efforts in bringing this innovative study to its perfect shape. I would also offer my thanks to Mr. Sikandar Khan and Mr. C.K. Mishra who took painstaking job of doing the computer typing and photocopying respectively of the report.

I hope the findings and suggestions made in the study would be useful to policy makers of the States and Govt. of India.

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Honorary Director
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CHAPTER I

INTRODUCTION

1.1 Preamble

"अमंत्र अक्षरम् नास्ति ना नौषधि वनस्पतिम्

अयोग्य पुरूषै नास्ति, योक्तास्तत्व दुर्लभः"

(There is no word, which have not power of becoming a useful sentence (mantra),there is no plant , which does not have quality to becoming a medicine and there is no person , which does not have qualities . Only the people are rare, who can identify and use them properly.)

There are so many plants now found in the world, which are identifying as medicinal and aromatic plants and, cultivators are cultivated them as a crop. However, our knowledge of medicinal crops has mostly been inherited traditionally, use of plants has mostly been inherited traditionally, use of plants for curing various ailments are not confined to the doctors only but is known to several households as well. There are many interesting and sometimes astonishing things to learn from collectors of medicinal herbs. Spreading and preserving this knowledge on medicinal plants and their uses has become important for human existence. There is a growing tendency all over the world to shift from synthetic to natural based products including medicinal plants. It is also timely now to consider neglected and little, known medicinal plants.

The cultivation of medicinal and aromatic crops provides sustainable means of natural source of high value industrial raw material for pharmaceutical, agri-chemical, food and cosmetic industries and opens up new possibilities for higher level of gains for farmer with a significant scope for progress in rural economy. Though, these plants have been known and used since ancient times to heal and cure diseases, recently, technological advancements and validation of traditional knowledge and usage are leading to consumer inclination towards naturals and high market value for these crops. Such crops in India now covering an area of merely about 0.4 million hectares are finding a much higher place in international agri- business with an estimated annual growth rate of 10-15 per cent.

In modern medicine also, plants occupy a very significant place as raw material for some important drugs, although synthetic drugs and antibiotics brought about a revolution in controlling different diseases. But these synthetic drugs are out of reach to millions of people. Those who live in remote places depend on traditional healers, whom they know and trust judicious use of medicinal herbs can even cure deadly diseases that have long defied synthetic drugs.

In India, the use of different parts of several medicinal plants to cure specific ailments has been in vogue from ancient times. The indigenous system of medicine namely 'Ayurvedic', 'Siddha' and 'Unani' have been in existence for several centuries. These systems of medicine cater the needs of nearly seventy per cent of our population residing in the villages. Apart from India, these systems of medicines are prevalent in Korea, China, Singapore, West Asia and many other countries. Besides the demands made by these systems as their raw material, the demand for medicinal plants made by the modern pharmaceutical industries has also increased manifold. Thus, these constitute a group of industrially important crops which bring appreciable income to the country by way of export.

Our pharmaceutical industry is fairly advanced and sophisticated. The plant based drugs, however have shortened the life span of the source of material. There is continuous search for more potent and cheaper raw material to feed the industry with concerted research and development effort, many medicinal plants could provide raw material in abundance to the indigenous pharmacies and local herbalists. Strong linkages should be developed between medicinal plant growers, health experts and pharmaceutical industries for developing scientific basis on which these systems of medicines are working. An integrated system of medicine based a natural products and synthetics may yield the most effective and cheap package for WHO's goal of "health for all by the year 2010"

India possesses a huge wealth of medicinal and aromatic crops and is traditionally associated with the use of medicinal and aromatic plants for human, livestock and plant health. With the present world going herbal, trends at consumer level favouring use of naturals are considered more harmonious with human metabolism. With

increasing global population and consequent rise in demand of pharma, perfumery and flavour industries for MAPs, farming of these crops becomes an attractive alternative to conventional crops.

In coming year land and water resources are sure to face acute degradation, also the stresses as of supply of nonrenewable fossil fuel and phosphates will be constrained while agri-chemical inputs gradually will have to be substituted. Under such conditions, MAP's with inherent capability to grow under natural stress with rather better yields of secondary metabolites (active constituents) would be crops of choice for sustainability. Isolation of bio-molecules from medicinal and aromatic plants and improving their contents in plants would further enhance the demand and consequently the profits as these molecules may find use in wide range of applications such as anti-bacterial, antifungal, anti-protozoan, anti-cancers, hepato-protective, anti-obesity, anti-diabetic, anti-depressants, cardiovascular and nerving stimulators and bio-enhancers.

Introduction of new rotation based upon these newly developed short duration genotypes have enabled growers to achieve profits ranging from 60-75,000/ha/year. *Mints* have really transformed the socio-economic status poor farmers with all round improvement in quality of their life with visible impacts in the form of housing, nutrition in form of balanced meals to the family, mechanization of their farms and machinery including post harvest processing capabilities and their visible move towards literacy with their children going to school.

Many medicinal and aromatic crops do not require intensive agri-inputs and grow well under natural stress conditions, may it be water, light, nutrients or salts. A number of aromatic grasses such as lemongrass, palmarosa, vetiver and plants like chamomile are the potential crops suited for salt affected soils providing subsistence profits ranging from Rs.15-20,000/hectares/ year to the poor farmers. These crops have great possibilities as a large chunk (more than 7.0 million hectares) of land is available across the country where food/vegetable crops just cannot be grown profitably.

Many varieties of plants like ashwagandha, senna, kalmegh, basil, lemongrass and palmarosa have been developed and demonstrated to grow well under

rain-fed/dry land conditions providing profits in the range of Rs.10-15,000/ha or more within a short crop period. Moreover, such MAPs can be successfully cultivated in areas prone to destruction of crops by wild animal.

The great importance of collecting good herbarium material for taxonomic identification of the collected species must be stressed. There is need for conservation of all useful plant species, and also cultivation, maintenance and assessment of germ plasm for future use, since among the most vulnerable plant species in India, the most over exploited are the medicinal plants. (Khanujia, et. al ,2005[1])

The Government of India with the help of Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow and State government with the help of their agricultural departments, agricultural universities and other institutions have taken the initiative for the all-round development of promising plants and has developed technology packages for cultivation of important medicinal and aromatic crops including genotypes producing quality nucleus material acceptable in world market. The developed agro-technologies have been beneficial for the farmers (especially marginal) as well as industries.

India is a leading exporter of the medicinal plants in the world trade. The major export of medicinal plant parts of whole plants from India are poppy husk and seeds, Psyllijm (Plantago ovata) husk and seeds, senna (cassia angustifplia) leaves and pods, chirayata (swertia angustifolia) galanthus (Alpinia S.P.) rhizomes. Tukmaria and Zedoary (Curcuma Zedoaria) roots, Periwinkle (catharanthus roseus) roots and leaves, Glycerrhiza glabra dried rhizomes, Ipecae dried rhizomes and roots, kuth roots, nux-vomica dried ripe seeds, Sarasparilla, Serpentina roots and some ayurvedic herbs.

Major importer of medicinal plants from India are U.S.A., Japan Germany, U.K. France and Switzerland, countries like South Korea and China are also important exporters of these plants. South Korea is the major exporter of ginseng (Panax SPP.) in the world market.

[1] Khanujia, S.P.S, Kalra, Alok and Singh, A.K. (2005) Gain from entrepreneurship, The Hindu Survey of Indian Agriculture, 192-194

During the past decade a dramatic increase in exports of medicinal and aeromatic crops attests to global interest in their products as well as in the traditional health system. Commercially, these plant derived medicines, essential oils and products are worth about US $ 72 billion (Rs.360, 000 crores) worldwide, which include global business of medicinal herbal material of US $ 60 billion (Rs.3000, 000 crores). According to the WHO estimates the projected demand for medicinal plants alone by the year 2050 would be US $ 5 trillion (Rs.250, 00,000 crores).

The domestic market of Indian System of Medicine and Homeopathy (ISMH) is of the order of Rs.4,000 crores (US $ 800 million) of which ayurveda drug market alone is about Rs.3,500 crores (US $ 700 million). India's total export earning from the crude drugs, herbal extracts and finished products stands at meager Rs.800 crores (US $ 160 million). However, India, with large and diverse geographical area gifted with rich plant biodiversity contributes hardly up to 2 per cent in the global trade. Interestingly, on the essential oil from the essential oil crops as against the world production of 1,10,000 t (US $ 9200 million). India contributes about 15 per cent in terms of production and much better proportion of 21 per cent for the value.

But amazingly, India's share in world export of essential oil and perfumery material is merely 0.4 per cent. It is estimated that India's annual production of MAP raw materials may equal about 6000 crores (US $ 1200 million). The future thrust holds great promise for India in the fast changing global economy as far as production and trade of natural raw material is concerned. The hold on value of aromatic produce is replicable for medicinal plants as collection to sound agro technologies research in India by R& D organizations like CIMAP with backing of post harvest processing technologies are also being developed at the same pace.

Madhya Pradesh a leading state in commercial cultivation and trade of many medicinal and aromatic plants specially Asgandh, Sarpgandha, Bach, Isabgol, Safed Musli, Muskdana, Rosha grass, Leman grass, Khurasani ajwain, sadabahar, Chandrasur, Chitraik and opium. The state having mega bio-diversity and 11 agro-

climatic regions, which caters the large varieties of medicinal and aromatic crops. (Table 1.1) There is wide scope for adoption of these crops.

Medicinal and aromatic plant diversity of Madhya Pradesh is very rich with its prosperous indigenous drug system particularly prevalent among tribal. Madhya Pradesh had an area of 18364 hectare with production 110184 tonnes under medicinal and aromatic crops. (2003)

There is a significant contribution of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in the field of bio-diversity conservation, and documentation of medicinal plants and indigenous Medicare prevalent among natives of Madhya Pradesh. The university developed agro techniques (package of practices) for cultivation medicinal (bach, muskdana, ashwagandha, Isabgol, sarpgandha, kalmegh, curcuma and safed musli) and aromatic (mentha, lemongrass, palmarossa, vetiver, german chameli, guggul, and eucalyptus) plants. The university developed a nursery for multiplication of seed /planting materials. About 100 species are available in the nursery for sale. During 1998-99 the seed and planting material of worth Rs. 1.87 lakh has been sold to the farmers and different organizations. In university more than 1000 plants species have been collected from the forests of Madhya Pradesh and conserved in herbal garden. The valuable species also procured from the various parts of the India. The Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur has been identified as Centre of Excellence for niche area of medicinal and aromatic plants by Indian Council of Agricultural Research, New Delhi.

Table 1.1 : Medicinal Crops of Madhya Pradesh

S. No.	Medicinal Crops	Useful part	Uses
1	*Ashwagandha (Withania Somnifera)*	Root	Skin disease, Blood pressure, Swelling, Wounds, filler, Joint pain.
2	*Sarpgandha (Rauvolfia Serpentina)*	Root	High blood pressure, hysteria
3	*Kalmegh (Andrographis Paniculata)*	Plant	Skin disease, Malaria, fever, blood purifier
4	*Safed Musali (Chlorophytum borivillinum)*	Rhyzome root	Ayurvedic medicine- Chavanprash, making diabetic medicine
5	*Satawar (Asparagus racemosus willd)*	Root	Acidity, Ulcer, to increase milk production in Cow & buffalo, skin disease, eye disease, develop resistance power.
6	*Sanai (Cassia angustifolia)*	Leaf	Stomach disease
7	*Gudmar (Gymnema sylvestre*	Leaf	Liver tonic, diabeties, heart disease, fever, white spot, snake bites, stomach pain, eye pain.
8	*Chandrasur (Lepidium Sativum L.)*	Leaf, Seed	Seed- as vegetable, salad, gum, increase milk production in mother, and in dairy cow & buffalow, digestion, eye disease, loose motion, ladies disease, child development, Asthama, piles, siflice, Leaf- anti scarbutic
9	*Ratanjot (Jatropha curcus L.)*	Plant Branch	Exima, Dad Used as Daton, Bio diesel, skin disease
10	*Isabgol (Plantago Ovata Forsk)*	Husk	Piles, Loose motion, Stomach disease
11	*Tulsi (Ocimum Sanctum)*	Leaf, Seed	Cosmetics, Cough seerup, digestion, ear pain, oil
12	*Bhui Aounla (Phyllanthus amarus)*	Plant	Urinary disease, Jaundice, stomach pain
13	*Mulaithi (Glycyrriza glabra L.)*	Under ground stem	Heart disease, Prepare tasteful medicine
14	*Kalihari (Gloriosa Superba Linn)*	Rhyzomes	Medicine of anticancer, antijaundice, Piles, Asthama
15	*Giloe (Tinospora Cordifolia Willd)*	Root, Stem, Leaf, Fruit	Root- Laprocy, Stem- Jaundice, Cough fever, white discharge, control of heart beeting, control blood pressure Leaf- Jaundice, Chicken pox Fruit- Jaundice, tonic
16	*Brahmi (Bacopa monnieri L.)Penn.*	Plant	Increase memory, Nerve tonic, Histeria
17	*Pattharchur (Coleus aromaticus)*	Leaf	Stomach pain, Karminative, Urine disease, kidney stone
18	*Makoy (Solanum nigrum L.)*	Plant	Fruit- Fever, Loose motion, eye disease Plant- Piles , Liver disease Leaf – Urinary disease
19	*Bia vidung (Embelia ribes Brum F.)*	Fruit	Anti worms, Loose motion, skin disease, tonic snake & crabs bites.
20	*Ajwain (Hyoscyamus niger L.)*	Seed	Loose motion, teeth pain relief, eye disease, Asthama, cough, urine, infection, siflice
21	*Pan (Piper betle)*	Leaf	Worms, Cough, digestion, heart

Now, the farmers of Madhya Pradesh diverted their some cultivated area in these medicinal and aromatic crops. (Table 1.2) But due the price fluctuations, lack of marketing facilities, absence of value addition by processing , lack of technical know

how of cultivation and procurement etc. problems related to these crops, the area as well as production of these crop fluctuate year to year or even season to season.

Table 1.2: Major Aromatic Crops of Madhya Pradesh and their Uses

S. No.	Crops & their botanical name	Useful part	Uses
1	*Lemongrass (Cymbopogon flexuosus steud)*	Oil	Cosmetic creams, soaps, insecticide, joint pain, odomas, gulab jal
2	*Pamarosa (Cymbopogon maritini stapf)*	Oil	Soap, Cosmetic, Scent, from its oil Jernoil extracted which used in Aroma industries
3	*Java citronela (cymbopogon winter ianus)*	Oil	Cosmetic, soap, preparation of aromatic jeeraniol, Hydroxisionel chemical, Anti mosqueto ointment deodorant.
4	*Tulsi (ocimum besilium)*	Leaf, Seed	Cosmetics, cough seerup, digestion, earpain, oil
5	*Mentha (Mentha arvensis L)*	Oil	Karminative, expectorant, stomach disease, cough & cold, throat infection, fever, gas
6	*Pachouli (Pogostemon calin Benth)*	Oil	Scent, oil is itself top quality scent, soap, cosmetic tobacco, cream, Anti worms, Medicine, its juice used in T.B.
7	*Rajnigandha (Polianthes tubrosa L.)*	Oil & Flower	Oil- in Aroma industries Flower- making Bucke, cut flower
8	*Jama rosa (Cymbopogon nardas)*	Oil	Cosmetic, knee pain and arthritics
9	*Lavender (Lavandula Officinalise L.)*	Oil	Soap, shaving cream, powder, Anti-worm, Aromatherapy
10	*Khus (Vetiveria Zizanioides)*	Oil, Root	Oil- Scent, Cosmetic, Medicine, Root- Used in cooler
11	*Nagarmotha (Cyperus Scariosus)*	Rhyzomes	Heart disease, Loose motion, Ladies disease, body resistance, siflice
12	*German Chameli (Matricaria Chamomella)*	Oil	Oil- Anti allergy, body resistance, cream, shampoo, Flower & plant- Digestion, Cough, hair die, wine industries
13	*Jasmine (Jasminum grandiflorum)*	Leaf, flower & plant	Leaf- mouth ulcer, Ear disease Flower- Crab bite, skin disease Plant- Loose motion, anti-worms, urine disease, and diseases concern with ladies.

Keeping these facts, the project entitled "Cultivation of Medicinal crops and Aromatic crops as a means of diversification in Agriculture in Madhya Pradesh" was entrusted to Agro-Economic Research Centre, , Jabalpur by Govt. of India, Ministry of Agriculture & Cooperation, Directorate of Economics & Statistics, AER Division, New Delhi with the following objectives.

Objectives of the Study

1. To understand the economics of cultivation/ production/ gathering of the selected medicinal and aromatic crops and find their economic and market potential as preferred for cultivation by the farmers.
2. To assess the extent of area being cultivated under selected medicinal and aromatic crops.
3. Estimation of domestic and international demand for the selected medicinal and aromatic crops in the light of the effect of new IPR regime on pharmaceuticals.
4. To study the relative economic impact of cultivation of medicinal and aromatic crops by the farmers (Relative costs- benefits, Market conditions).
5. To identify the bottlenecks in the marketing of medicinal and aromatic crops and suggest possible remedies.

1.2 Research Methodology:

The study was confined to one of the leading state in cultivation of medicinal and aromatic crops of India i.e. Madhya Pradesh contributing about 10 per cent of area of India. The areas under these medicinal & aromatic crops grown in the State were taken as a parameter for selection of crops. One crop from medicinal group and another one from aromatic group were selected for the depth-in study. In Madhya Pradesh the MAPS' are growing in the area of 14,352 ha. In which the Isabgol (30.40%) occupied the maximum acreage. Hence, Isabgol crop was selected in medicinal group, while the lemon grass (289 ha) is a dominating crop in aromatic group, as it an only aromatic crop of the state having the recorded data and grown in large scale was selected for the study. (Table 1.3)

Table 1.3 Medicinal and aromatic crops grown in Madhya Pradesh

S. No.	Medicinal & Aromatic Crops	Area in ha.	(percentage)
1	Isabgol	4,372	(30.46)
2	Ashwagandha	2,388	(16.64)
3	Ajvayan	2,213	(15.42)
4	Safed Musali	1,080	(7.53)
5	Lemongrass	289	(2.01)
6	Pan	172	(1.20)
7	Ratan jot	100	(0.70)
8	Others (Kalmegh, Satawar, Sarpgandha, Chandrasur, Brahmi, Patthar Chur, Mulaithi etc.	3,738	(26.05)
Total		14,352	(100.00)

In Madhya Pradesh Isabgol was grown in the area of 4372 ha. Mandsour (73.58%), Neemuch (19.99%), Jabalpur (2.74%) and Ratlam (1.52%) were found the major Isabgol growing districts of the State . Out of these Mandsour district was purposively selected for the study having maximum area under the crop. (Table 1.4) In the same line the Jabalpur district was selected for studying the various aspects of the study. As, the district contributing maximum acreage of lemon grass (36.33%) amongst all the districts of the state. The other major lemon grass growing districts of the state were found are Ratlam, Indore, Chattarpur, Betul, Bhopal, Khandwa, Katni, Morena, Chindwara, Shivpuri, Tikamgarh , Dhar etc. (Table 1.5)

Table 1.4: Isabgol growing districts of Madhya Pradesh

S.No.	**District**	**Isabgol Area**	**(Percentage)**
1	Mandsaur	3,217	73.58
2	Neemuch	874	19.99
3	Jabalpur	120	2.74
4	Ratlam	66	1.51
5	Hoshangabad	26	0.59
6	Indore	25	0.57
7	Khandwa	13	0.30
8	Katni	11	0.25
9	Chhindwara	6	0.14
10	Morena	6	0.14
11	Shivpuri	4	0.09
12	Dhar	2	0.05
13	Tikamgarh	2	0.05
Madhya Pradesh		**4,372**	**100**

Table 1.5: Lemon grass growing districts of Madhya Pradesh

S.No.	District	Area (ha)	Percentage
1	Jabalpur	105	36.33
2	Ratlam	66	22.84
3	Indore	25	8.65
4	Chattarpur	17	5.88
5	Betul	16	5.54
6	Bhopal	14	4.84
7	Khandwa	13	4.50
8	Katni	11	3.81
9	Morena	8	2.77
10	Chhindwara	6	2.08
11	Shivpuri	4	1.38
12	Tikamgarh	2	0.69
13	Dhar	2	0.69
Madhya Pradesh		**289**	**100**

The villages having maximum acreage under the cultivation of the selected crops has been further selected for the study. A snow ball technique was used for selection of respondents in the area under study. The 50 respondents from five villages (Balaguda, Badari, Turkiya, Narayangarh, and Piplia visnia) in Mandsour district were selected for studying various aspects of the Isabgol. Further, 50 respondents from ten villages (Padwar, Diyakheda, Nayagoan, Manegoan, Mahegawa, Nipanina, Sagada, Majeetha,Chinerai and Junwani) were selected in Jabalpur district for studying the various aspects of lemon grass in the area under study.

Both the primary as well as secondary data were collected for the study. The primary data on different aspects of the study i.e. general informations about the respondents, their occupations, land use and cropping pattern, economics of cultivation of Isabgol, lemon grass, and their competitive crops (wheat for Isabgol and wheat and paddy for Lemon grass), motivating and decision making factors etc, were collected from the sample respondents with the help of pre-tested interview schedules by personal contact. The primary data were also collected from the traders of medicinal plants, regulated markets etc. Further, the secondary data of the study were collected from the Directorate Horticulture, Bhopal Directorate Agriculture , Bhopal, Deputy Director of Horticulture, Mandsour and Jabalpur , Agricultural statistical Office , Mandsour and Jabalpur, College of Horticulture, Mandsour , College of Agriculture, Jabalpur. These data were colleted

on area, production, recommended cultivation practices of Isabgol and lemon grass etc. aspects for the study. The primary data were colleted for the year 2003-2004 and the secondary data are related to the year 1995-96 to 2002-03.

Mean, percentage, regression coefficient and linear growth statistical tools were used for analysis the collected data. Where as, the operational cost, variable cost, fixed cost, total cost, gross return, net return over variables cost, net return over total cost, return per rupee at variable cost, return per rupee at total cost etc. are the cost of cultivation concepts which were used for analyzing the cost of cultivation of the selected crops.

1.3 Salient Features of Selected Crops:

As Isabgol from medicinal group and lemon grass in aromatic group were selected for the study. The salient features of these crops are given in this subhead.

1.3.1 ISABGOL (Plantago Ovata Forsk)

Plantago is genus of over two hundred and fifty species and ten species are found in India. These are scapigerous herbs. Psyllium husk, which is commonly known as "Isopgul" is obtained from ripe seeds of *Plantago Ovata Forsk* and *Plantago Psyllium Decne.* There are three types of Isabgol i.e. white ,red and black, in which only white is used as medicines, while others are of low standards. It comes under family-Plantensi.

	**A natural remedy for constipation regulates bowel functions. A bulk forming laxative** • Help reduce risk of heart attack by decreasing serum cholesterol through proper excretion of bile acids. • Consumed with water prior to meals, reduces constipation of fat and calorie. • Help reduce risk of heart attack by decreasing serum cholesterol through proper excretion of bile acids
ISABGOL (Plantago Ovata Forsk)	**Main Uses of ISABGOL (Plantago Ovata Forsk)**

The fruits of Isabgol are of 8 mm long its upper half separates like a lid. Seeds are boat shaped Pinkish gray brown in colour. Each seed is encased in a thin, while translucent membrane called husk. The husk is odorless and tasteless. Plantago Ovata is distributed in canary Islands, Mediterranean regions of the southern Europe and North Africa to Pakistan. It is cultivated in large scale in India and Pakistan. In India the crop is commercially cultivated in Banas Kantha and Mehsana districts of Gujarat and adjoining areas of southern Rajasthan. It is also cultivated in Madhya Pradesh, Rajasthan, and Haryana. It is cultivated in 16000 ha of land in India. In today's worlds, India has a monopoly in production and trade of Ibsabgol (Tiwari, 2004[2]) .The crop is sown during the *Rabi* season (November- December).

The husk from the seed is separated by physical process. The seeds are cleaned and fed to series of shellers. To remove only the husk in each sheller the grinding pressure is adjusted. This is separated by fans and sieves at each sheller, and the underground material is sent to the next sheller. The husk and seed ratio is 25:75 by weight. Isabgul husk is the dry seed coat of Plantago Ovata, obtained by crushing the seeds and separating the husk by winnowing. In its husk fatty acids (lanolin, oleic and pametric acids) are present. From the seeds amino acid; malaline, alanine, cutemine, gycine, cystinelyine,lucine and triocineare present jointly. First three and triocine are present in free form. In seed gucocide is also present, which is called as ofubin.

Isabgol seeds are mostly used in medicine because of its mucilage which is colloidal in nature and serves as a safe bulk laxative which promotes regular bowel movement. For chronic dysenteries of amoebic and basillary origin, this is administered. The seeds and husk are used to cure inflamation of the mucous membrane of gastro-intestinal and genito urinary tracts, dueodenal ulcer gonorrhoea and piles. It can also be used as cervical dilater for termination of pregnancy. Besides its use in medicine, mucilage is also used in various industries like food processing, sizing of textile and paper, and in cosmetics as a base. The embryo oil of seeds has 50% linoleic acid which prevents arteriosclerosis.

[2] Tiwari,J.P. (2004) Medicinal Plants: Agriculture and Uses Pp 15-16

1.3.2LEMONGRASS (Cymbopogon flexuosus)

The botanical genus name cymbopogan is derived from Greek Kymbe "boat" and pogon beard", it refers to the boat shaped spathes and the many awned inflorescences which remind to a beard.

Lemongrass comes under family – Poaceae (Gramineae), and is a perennial herb widely cultivated in the tropics and subtropics, designates two different spices, East Indian, *Cymbopogon flexuosus (DC) Stap*f, and West Indian *Cymbopogon citratus* (DC ex Nees) *Stapf*. East Indian lemongrass, also known as cochin or Malabar grass is native to India, while west Indian lemongrass is native to southern Indian and Ceylon. The lemongrasses are cultivated commercially in Guatemala, India, the people's Republic of china, Paraguay, England, Sri Lanka and other parts of Indochina. Africa, Central America and South America. The Plant grows in dense clumps up to 2 meters in diameter and has leaves up to 1 meter long.

The plants need a warm, humid climate in full sun. They grow well in sandy soils with adequate drainage. Since the plants rarely flower or set seed, propagation is by root or plant division. The plants are harvested mechanically or by hand about four times each year with the productive population lasting three to five years.

The quality of lemongrass oil is generally determined by the content of citral, the aldehyde responsible for lemon odor. Some other constituents of the essential oils are

terpineol, myrcene, citronellol, methyl heptenone, dipentene, geraniol, limonene, nerol, and farnesol, West Indian oil differs from East Indian Oil in that it is less soluble in 70 per cent alcohol and has a slightly lower citral content.

Lemongrass is used in herbal teas and other nonalcoholic beverages in baked goods, and in confections. Such as soaps and creams, Citral extracted from the oil, is used in flavoring soft drinks in scenting soaps and detergents, and as a mask for disagreeable orders in several industrial products, Citral is also used in the synthesis of ion ones used in perfumes and cosmetics.

The grass is considered a diuretic, tonic and stimulant. It promotes good digestion, and a preparation of lemongrass with pepper has been used for relief of menstrual troubles and nausea. It induces perspiration, to cool the body and reduce a fever. Lemongrass is generally recognized as safe for human consumption of as a plant extract/ essential oil.

As a medicinal plant, lemongrass has been considered a carminative and insect repellent. West Indian lemongrass is reported to have antimicrobial activity oil of West Indian lemongrass act as a central nervous system depressant. Oil of East Indian lemongrass has antifungal activity. The volatile oils may also have some pesticide and mutagenic activities. It is used to relief headache and tension by aromatherapy. It is also used for beer brewing and preparation of spiced wines.

1.4 A Brief Review about the Crops and their Uses

The National Medicinal Plant Board, New Delhi has identified specific 32 medicinal progeny. There demands are increasing in domestic & international market. The list of identified medicinal crops by the government of India is as follows.

Table 1.6 : The list of identified medicinal crops by the government of India

S. No.	Medicinal Crops	Useful part	Uses
1	*Aounla (Emblica officinalis)*	Fruit	Aurvedic medicine- Triffla, Chavanprash
2	*Ashok (Saraca Osoca)*	Bark	Kidney stone, Urinary disease, gynecological disease
3	*Makoy (Solanum nigrum)*	Plant	Fruit- Fever, Loose motion, Eye disease Plant- Piles, Liver disease Leaf – Urinary disease
4	*Ashwagandha (withania somnifera)*	Root	Skin disease, Blood pressure, Swelling, wounds filler joint pain
5	*Mulaithi (Glycyrrhiza glabvra)*	Underground stem	Heart disease, prepare tasteful medicine
6	*Atees (Aconitumhetero phyllum)*	Root	Tonic, Cough, Loose motion
7	*Safed Musali (Chlorophytum brovillianum)*	Rhyzomes root	Aurvedic medicine- Chavanprash, making diabetic medicine
8	*Bel (Aegle marmelos)*	Seed gum pulp	Acidity, stomach disease
9	*Bhui Aounla (Phyllanthus amarus)*	Plant	Urinary disease, Jaundice, Stomach pain
10	*Kesar (Corcus sativa)*	Flower	Stomach pain, Carminatives, Urine disease, kidney stone
11	*Brahmi (Bacopa monnieri)*	Plant	Increase memory, Nerve tonic, Hysteria
12	*Chiraita (Swertia Chirata)*	Plant	Stomach pain, worms, Loose motion, Asthama, Piles, Liver disease
13	*Giloe (Tinospora Cardifolia)*	Root, Stem, Leaf, Fruit	Root – Leprosy, Stem – Jaundice, cough fever, white discharge, control of heart beating, control blood pressure. Leaf- Jaundice, chicken pox, Fruit- Jaundice, tonic
14	*Sarpgandha (Rauvolfia serpentina)*	Root	High blood pressure, hysteria
15	*Gudmar (Gymnema Sylvestre)*	Leaf	Liver tonic, diabetes, heart disease, fever, white spot snake bites, stomach pain, eye pain.
16	*Sanai (Cassia angustifolia)*	Leaf	Stomach disease
17	*Guggle (Commiphora wightii)*	Gum	Worms, cough, eye tonic, removal of blood impurity, joint pain
18	*Sataveri (Asparagus racemasus)*	Root	Acidity, to increase milk production in cow & buffalo, skin disease, eye disease, develop resistance power.
19	*Isabgol (Plantago Ovata Forsk*	Husk	Piles, Loose motion, stomach disease.
20	*Tulsi (Ocimum sanctum)*	Leaf. Seed	Cosmetics, cough syrup, digestion, ear pain, Oil
21	*Jatamasi (Nardostachys jatamansi)*	Rhizomes	Hysteria, heart tonic, hair tonic, low blood pressure, in making hair oil.
22	*Bia vidung (Embelia ribes)*	Fruit	Anti worms, loose motion, skin disease, snake & crab bites.
23	*Kalihari (Gloriasa Super ba)*	Rhizomes	Medicine of anti cancer, anti jaundice, piles, asthama.

S. No.	Medicinal Crops	Useful part	Uses
24	*Vatsanabh (Aconitum atrox)*	Root	Anti-pyretic, diaphoretic, skin disease, made ointment by root that used in joint pain.
25	*Kuth (Saussurea costus)*	Rhizome	Tonic, worms, Asthama, heart, cholera, scent, ulcer
26	*Kokum (Garcinia indica)*	Fruit	Fruit- Anti scorbutic, excitement, Bark- excitement, loose motion, Leaf- Loose motion, oil, skin disease.
27	*Kalmegh (Andrographis Paniculata)*	Plant	Skin disease, Malaria, fever, blood purifier
28	*Daruhaldi (Berberis aristata)*	Plant Root Root bark	Resistance power, loose motion Tonic, anti-periodic, loose motion, purgative Eye disease, lever, spleen disease
29	*Chandan (Santalum album)*	Wood dust	Oil used, high fever, soft drink, energy to heart, wounds, and Aroma Business.
30	*Pashand bhed (Coleus barbetus)*	Leaf & root	Kidney stone, its leaf & root used as spices in making food
31	*Pippli (Piper longum L)*	Fruit	Un ripe fruit – Tonic, fruit & root- pain relief, loose motion, Leprosy snake bite, Ladies disease, Ripe fruit & root- stomach pain, cough Respiratory tube disease.
32	*Kutkii (Picrorhiza Kurroa)*	Root	Cough and cold

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CHAPTER II

PROFILE OF THE STUDY AREA

The group of medicinal and aromatic plants comprises a large of spices which provides raw material for pharmaceutical, photochemical food flavors, cosmetic and perfumery industries. Majority of the commercial supply of medicinal derived from the wild resources and due to increasing demand of herbal drugs, many of these spices are frequently facing a constant threat of extinction. Mounting demand of these medicinal plants spices can only be fulfilled by promoting the large scale cultivation of the suitable crop and conserve of bio-diversity of the natural resources. Medicinal and aromatic plants diversity of Madhya Pradesh is very rich with its prosperous indigenous drug system particularly prevalent among tribal. Due to the scientific research and development programme related to medicinal and aromatic crops in Madhya Pradesh. By the massive efforts of the government and other agencies, the area as well as production of these crop increased from 23328 ha to 27892 ha and 139968 t to 167352 t respectively from 1999 to 2001 in Madhya Pradesh. The cultivators were attracted from the market price the products of these crops, but soon after when the supply of the product are increases the price of these product were fell tremendously.

The problems related to medicinal and aromatic crops are lack of location specific research related to these medicinal and aromatics crops suited to the soil and climate different agro-climatic conditions of the Madhya Pradesh. The lack of technical knowledge of cultivation of these crops, the poor value addition and inadequate marketing facilities for the produce of these particular crops in the state, has resulted into decreasing trend of area and production. The area and production for these crops during the period from 1999 to 2002 decreased by 1592 ha and 9554 ton per year. (Fig.1)These factors call for the further intestifications of the efforts of the government. **The marketing facilities and information net work in the state are so weak that the list of processing plants in the state are not available to the research workers.** (Appendix -1) Although, there are few processing plants of low capacity are functioning but not in the records. The time series data related to area and production of various medicinal and aromatic crops being cultivated in the state has not gave due weight-age as other crops. The *patwar*i of particular village has not recorded data of these crops, as area under theses crops particular village is negligible.

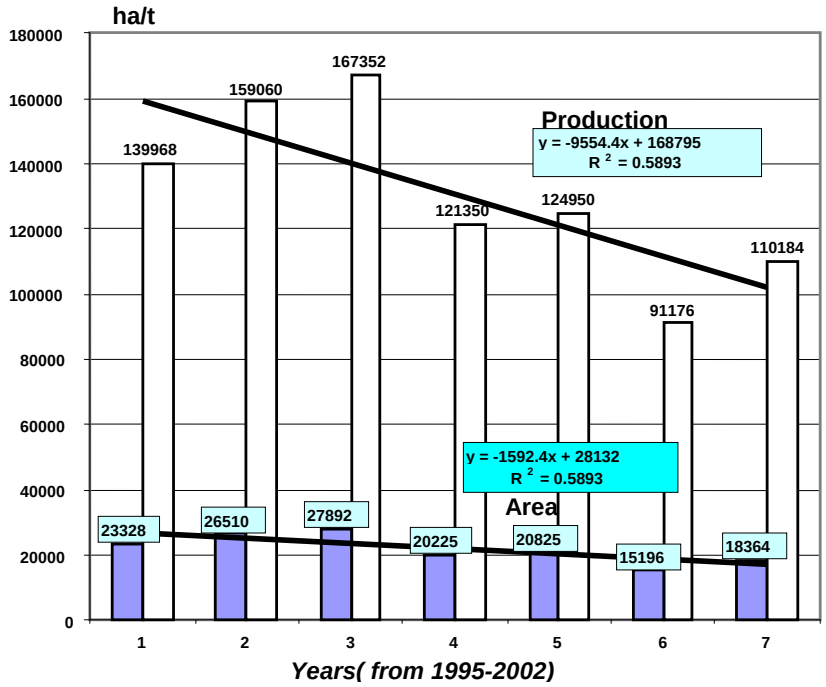


Fig. 2.1: Area & production of medicinal and aromatic Crops in M.P.

Hence, the efforts are made by the government officials that the secretary of the gram panchayat will also look after the records the village *patwari* that whether he records data of all crops i.e. major or minor sincerely or not. Further, there is an urgent need to adopt scientific measure for cultivation, long term preservation, protection and sustainable utilization of medicinal and aromatic crops in the state. The development programme on medicinal and aromatic plants is also required to be monitored by quality analysis of the produce in order to ensure materials of uniform quality in term of alkaloid, essential oil and other chemical constitutions for which these plants are valued in the market.

The main medicinal plants which are growing at commercial lines and recommended by the state government for the cultivation are ashwagandha (*Withania somnifera L. Dunal L.*), sarpgandha (*Rauvolfia serpentina L.*), kalmegh (*Andrographis*

peniculata), bhui aounla (*Phyllanthus amarus Schum & thonn)*, mulaithi (*Glycyrriza glabra L.*) , kalihari (*Gloriosa superba Linn.*), giloe (*Tinospora cordifolia Willd.)*, gudmar(*Gymnema sylvestre*), satawar(*Asparagus racemosus Willd.*), tulsi (*Ocimum sanctum*), sanai (*Cassia angustifloia Vahl.*), brahmi (*Bacopa monnieri L.Penn.*), pattharchur (*Coleus forskohlli*), makoy (*Solanum nigrum L.*), biavidung (*Embelia ribes Burm F.*), safed musli(*Chlorophytum borivillianum*), isabgol (*Plantago ovata Forsk.*), ajwayan(*Trachyspermum ammi L.*.), pan (*Piper betle*), ratanjot (*Jatropha curcus L.*), Chandrasur (*lepidium sativum L.*), whereas the main aromatic plants which are grown in M.P. are lemon grass (*Cybmbopogon flexuosus Steud*.) , pamarosa (*Cybmbopogon maritini Stapf*.), jamarosa (*Cybmbopogon nardas*), khus(*vetiveria zizanioides*), mentha (*mentha arvensis L.*), rajni gandha(*Polianthes tubrosa L.*), lavender (*Levendula officinalis L.*), jasmine(*Jasminum sembsi*), nagarmotha (*Cyperus scariosus*), pachouli(*Pogostemon calin Benth*.) german chameli (*Matricaria Chamomella*), java citronela (*Cybmbopogon winterianus*)etc. But these crops are grown in very small scale due the risk (particularly related to the market price of the produce) in taking these crops in the area under study. It is also mentioned that traders, who sold the planting materials of these crops are in benefited, as they sold the planting materials at higher price to the cultivators at the time when the supply of these crop was low and the price in the market was high. They take the advantage of the time. And when the produce of the cultivators are came in the market, due to more supply their prices lowered down.

2.1 General Description of the State:

Madhya Pradesh, in its present form, came into existence on November 1, 2000 following its bifurcation to create a new state of Chattisgarh. The undivided Madhya Pradesh was founded on November 1, 1956.Madhya Pradesh, because of its central location in India, has remained a crucible of historical currents from North, South, East and West.

Madhya Pradesh is situated in the heart of India between latitudes 17^0-26^0 North and longitude 74^0 –84^0 East. It is the second largest state after Rajasthan of Indian Union with a total geographical area of 308 thousand square Kilometers. In terms of population (6, 03, 85,118) it occupies 5^{th} position in India (2001). It has 9-commissionaire division (Chambal, Gwalior, Bhopal, Ujjain, Indore, Sagar, Rewa, Jabalpur and Hoshangabad) divided into 45 districts, 260 tehsils, 313 blocks & 370 towns and 76,468 villages. It is abundantly rich in minerals and bio resources. With 27% of land area under forests, it supports a wide variety of animal and plant life. The state has a rich history, culture and crafts.

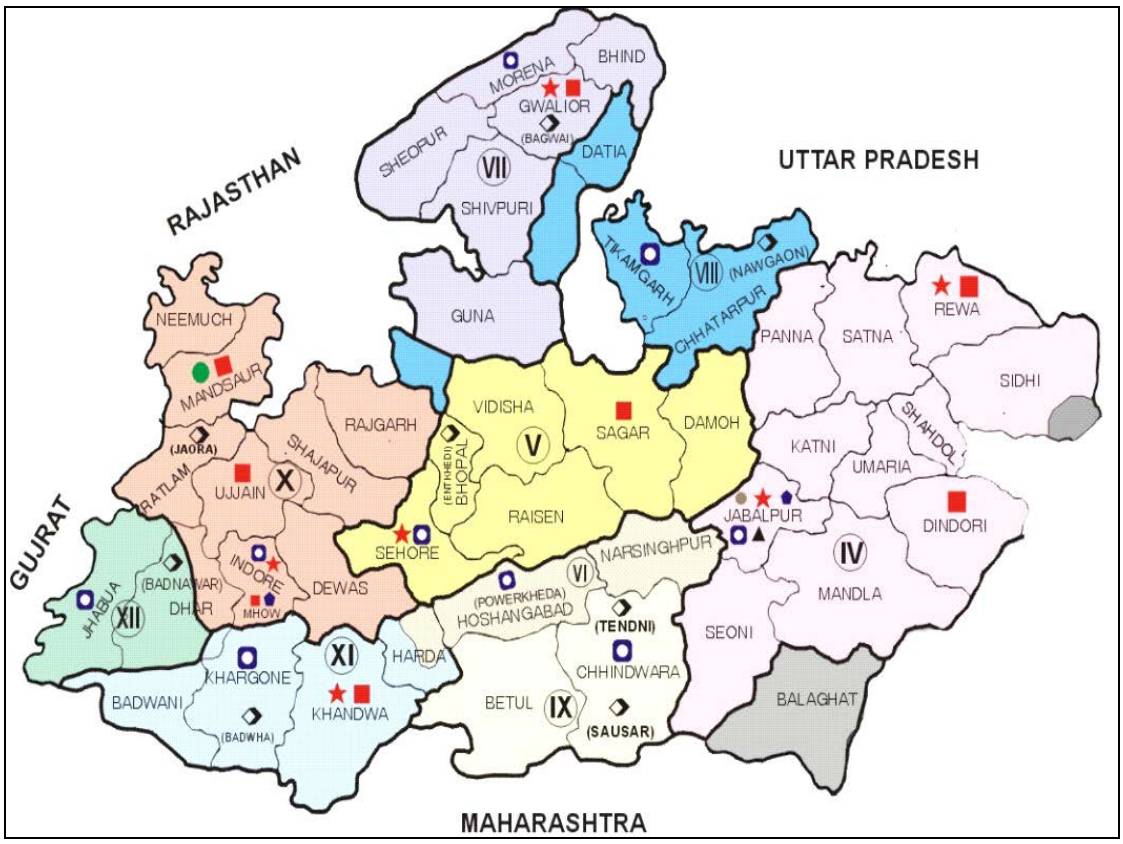
2.2.2 Physiography:

The Physiography of the state exhibits a great deal of diversity with areas ranging from less than 50 meter above Mean Sea Level to more than 1200 meter. The state falls under the catchments of Jamuna, Ganga, Narmada, Mahanadi and Godavari. On the basis of broad land features, the state could be classified in 5 physiographic regions and 11 agro-climatic zones (Table2.1& Fig 2.2.)

1. Northern low lying plains comprising Gwalior, Bhind and Morena districts and extend to Bundelkhand up to the west of Panna range and excludes certain parts of Rewa district between Panna and Kymore hills of Baghelkhand.
2. The Malwa and Vindhyan Plateau comprises of Vidisha, Shivpuri, Datia, Guna, Morena, Ujjain and Mandsour districts and parts of Sehore, Raisen and Dewas districts. It consists of large undulating plains of black cotton soil

dotted with flat-topped hills. It has also hilly Vindhyan Plateau situated it the north of Narmada Valley and to the south of the low-lying regions of Bundelkhand and Baghelkhand. It spared from east of Malwa plateau to Maikal and Dorea hills Satpura range

3. The Narmada Valley stretching from Jabalpur in the east up to Barwani district in the west. It is nearly 560 Km long and 48 Km wide and is walled on the north by the Vindhyan range and on the south by Satpura range. It covers the districts of Jabalpur, Nasinghpur, Hoshangabad, Khandwa, Khargone, Barwani, Dhar, and some parts of Raisen, Sehore, and Dewas districts.
4. The Satpura range runs from west to east for about 640 Km through Khandwa, Betul, Chhindwara, Seoni, Mandla, Bilaspur and Sarguja districts. Its northern spurs go into Hoshangabad and Nasinghpur districts and in the south an extensive spur of 160 Km covers entire Balaghat districts.
5. Madhya Pradesh also covers Balaghat and Shahdol district of Chattisgarh Plains and Northern Hills of Chattisgarh zone respectively.



AGROCLIMATIC ZONES

- I. CHHATTISGARH PLAINS
- IV. KYMORE PLATEAU AND SATPURA HILLS
- V. VINDHYAN PLATEAU
- VI. CENTRAL NARMADA VALLEY
- VII. GIRD ZONE
- VIII. BUNDELKHAND ZONE
- IX. SATPURA PLATEAU
- X. MALWA PLATEAU
- XI. NIMAR VALLEY
- XII. JHABUA HILLS

Fig. 2.2: Agro-Climatic Zones of Madhya Pradesh

Table-2.1: Agro-Climatic Regions and covered Districts /Tehsils in Madhya Pradesh

(Area in Lakh ha)

Agro-Climatic Regions	Districts/Tehsils	Geogra-phical Area	Percent to Geograp hical Area
1.Malwa Plateau	Indore, Dhar, (Dhar, Badnawar, Sardarpur tehsils) Shajapur, Mandsour, Neemuch, Ratlam, Ujjain, Dewas Rajgarh districts and Petlawad tehsil of Jhabua district	51.47	16.74
2.Vindhyan Plateau	Bhopal, Vidisha, Sehore (Sehore, Ashta, Ichhawar, Nasrullaganj tehsils) Raisen (Raisen, Gairatganj, Begamganj, Silwani, Goharganj, Udaipura tehsils), Damoh, Guna (Chachora & Raghogarh tehsils) & Sagar districts	42.59	13.85
3.Central Narmada Valley	Hoshangabad (Seoni-Malwa, Hoshangabad, Sohagpur tehsils), Harda, Nasinghpur districts, Budhani and Barelli tehsil of Sehore and Raisen districts respectively	17.45	5.67
4.Satpura Plateau	Betul, Chhindwara districts	21.93	7.13
5.Jhabua Hills	Jhabua, Jobat, Alirajpur tehsils of Jhabua district & kukshi tehsil of Dhar district	6.88	2.24
6.Gird Region	Gwalior, Bhind, Morena, Shivpur-Kalan, Guna (Mungawali and Ashoknagar tehsils), Shivpuri (Shivpuri, Kolaras, Pohari tehsils)	31.85	10.36
7. Kymore Plateau	Jabalpur, Katni, Rewa, Panna, Satna, Sidhi, Seoni and Gopadbanas & Deosar tehsils of Sidhi district.	49.97	16.25
8.Bundel Khand Region	Tikamgarh, Chhatarpur, Datia districts, Karela, Pachore tehsil of Shivpuri and Guna tehsil of Guna district	22.82	7.42
9.Nimar Valley	Khandwa, Khargone, Burhanpur, Barwani district, Manawar tehsil of Dhar district and Harda district	25.17	8.18
10.Northern Hills of Chattisgarh	Shahdol, Umariya, Anuppur, Mandla, Dindori district & Singrauli tehsil of Sidhi district	28.17	9.16
11. Chattisgarh plain	Balaghat district	9.25	3.00
Madhya Pradesh		307.55	100.00

2.1.2 Soils:

The main soil types found in Madhya Pradesh are alluvial, deep black, medium black shallow black, mixed red and black, mixed red and yellow and skeletal soils. (Table 2. 2)

Table 2.2: - Soil types and districts covered in Madhya Pradesh.

Types of Soil	Districts covered
Alluvial Soil	Bhind, Morena and Gwalior
Deep Black Soil	Hoshangabad and Nasinghpur
Medium Black Soil	Jabalpur, Sagar, Vidisha, Sehore, Damoh, Guna, Bhopal, Raisen, Rajgarh, Indore, Dewas, Ujjain, Mandsour, Shajapur, Ratlam, Dhar, Khargone and Khandwa
Shallow Black Soil	Betul, Chhindwara and Seoni
Red & Black Soil	Shivpuri, Rewa, Satna, Panna, Sidhi, Chhaterpur, Tikamgarh, Datia and some parts of Guna district.
Red & Yellow Soil	Balaghat.
Gravelly Soil	Mandla.

2.1.3 Climate:

The climate of Madhya Pradesh by virtue of its location is predominantly moist sub humid to dry sub humid, semi arid to dry sub-humid and semi arid in east, west and central plateau and hills respectively, according to agro-climatic regions of India. The seasons in Madhya Pradesh are as given below:

Table 2.3: Seasons and their periods in Madhya Pradesh

Seasons	Period	
	From	To
Rainy	June	September
Post Monsoon	October	November
Winter	December	February
Summer	March	May

2.1.3.1 **Rain fall:**

The annual rainfall received in the state varies from 800 mm. in the northern and western regions to 1600 mm in the eastern districts. In some years rainfall goes much below to the normal. Most of rainfall is received in the Monsoon season from June to September and about 10 per cent of the rainfall is received in the remaining part of the year.

2.1.3.2 **Temperature:**

The maximum temperature during extreme summer reaches as high as 47^0C and the minimum during winter dips up to 5^0C. The maximum normal temperature varies between 25 and 35^0C and minimum normal between 10^0 to 20^0C.The relative humidity ranges from 40 to 70 % throughout the year.

2.1.4 **Land use pattern:**

Classification of land use gives an idea of how the land is put to different use and where intensive cultivation can be adopted in particular and how the limited land available can be put to alternative uses for the development of the area in general without affecting adversely the environment ecology. Madhya Pradesh occupies to total of 30755.60 thousand ha of geographical area out of this 48.93% (15048.50 thousand ha) is the net area sown with 4842.73 thousand ha under double cropping area. The cropping intensity was only 123.66 per cent for the state as a whole. The State also has 27.90 per cent of the area under forest, 3.83 per cent area under uncultivated land, and 3.93 per cent under fallow land. (Table 2.4)

Table 2.4: Land use pattern of Madhya Pradesh (Thousand ha)

Particulars	Area	Percentage to Geographical area
Geographical area	30755.60	100
Forest area	8580.00	27.90
Land not available for cultivation.	3350.40	10.89
Uncultivated land.	1177.50	3.83
Waste land	1379.34	4.48
Fallow land	1219.90	3.97
Net area sown	15048.50	48.93
Double cropped Area	4842.73	
Gross Cropped Area	19891.20	-
Net area irrigated	5630.91	37.41
Cropping Intensity %	123.66	-

2.1.5 Population:-

Out of 6.03 crores total population of the state, rural population is 4.42 crores (73.33%) and the urban population is 1.61 crores (26.67%). There are 3.14 crores of male and 2.89 crores of female. The male female ratio in state was of 920 female per thousand male. The density of population per sq. km was 196. The literacy rate in M.P. was 64.08 per cent and male literacy rate (67.87%) was higher than the female literacy rate (58.28%). The urban literacy rate (79.69%) was also higher than the rural literacy rate (58.10%). The total working force in the state was only 36.10 per cent of total population, out of which cultivators were 49.50 per cent, land less labours were 23.70 per cent and other were 26.80 per cent. (Table2.5). The rate of increasing rural population in different census was higher than the urban population as compared to India (Table 2.6)

Table 2.5: - Population parameters of M.P.(Census-2001)

Particulars	Population	Percentage to the total population
Population		
Male	3,14,56,873	52.09
Female	2,89,28,245	47.91
Rural	4,42,85,528	73.33
Urban	1,61,02,590	26.67
Total Population	6,03,85,118	100.00
Female per thousand male	920	
Density per Sq Km	196	
Literacy Rate		
Rural Literacy		58.10
Urban Literacy		79.69
Male Literacy		76.87
Female Literacy		50.28
Total Literacy		64.08
Working Force		
Cultivators		49.50
Landless labours		23.70
Other working Force		26.80
Total Working Force		36.10

Table 2.6 : Per cent increase in Rural and Urban Population during Different census.

Censuses	Rural		Urban	
	India	M.P.	India	M.P.
1951	8.80	4.82	41.40	34.52
1961	20.64	22.83	26.41	39.57
1971	21.63	26.83	38.23	44.31
1981	19.32	21.28	46.14	52.92
1991	20.01	22.44	36.47	43.92
2001	17.97	22.02	31.13	31.19

2.1.6 Cropping Pattern:

Madhya Pradesh occupied 125.36 million ha of land under total food grains, which was 14.42 per cent of the India. The total acreage under major cereals, pulses and oilseed were 126.88, 23.82 and 26.71 million ha which were respectively of 10.31, 21.2 and 23.10 percentage of the India. (Table 2.7.1). As regards to total production of M.P. the State produces 203.94 million tonnes of total food grains, in which cereal production was of 214.63 million t, pulses production was 14.81 millions t. and oilseed production was 25.21 million t. The M.P. contributed 8.08, 24.02 and 22.30 per cent of total cereals, pulses and oilseeds respectively to India's production. The productivity of bajra, gram, arhar and rape seed and mustard in M.P. was that of higher than the India, while the productivity of other crops was lower in M.P. (Table 2.7.2)

Table 2.7.1: Area, Production and Productivity of Major crops of Madhya Pradesh as compared to India.

Particulars		Area (mill. ha.)		Production (mill. Tonnes)		Productivity (Kg/ha)	
		India	Share of M. P.	India	Share of M. P.	India	M. P.
A.	Major cereal crops	126.88	10.31	214.63	8.08	1691	1206
	Rice	44.60	11.90	85.99	6.2	1928	1013
	Wheat	27.40	17.00	70.78	11.8	2583	1794
	Jowar	9.98	8.1	8.71	9.1	873	975
	Bajra	9.28	1.5	7.03	2.40	758	1172
	Maize	6.08	14.00	10.66	11.00	1755	1389
	Coarse cereals	29.54	9.4	31.46	8.00	1065	898
B.	Total pulses	23.82	21.2	14.81	24.01	622	7.9
	Gram	8.41	31.70	6.68	36.80	794	924
	Arhar	3.47	11.5	2.77	12.60	799	861
C.	Total oil seed	26.71	23.10	25.21	22.30	944	912
	Groundnut	7.57	3.4	9.16	2.80	1210	1005
	Soybean	6.31	70.00	6.94	64.40	1100	1012
	Rapeseed &mustard	6.60	10.50	5.77	11.60	875	968
D.	Cotton	9.28	5.40	12.18*	3.50	223	145
E.	Total Food grains	125.36	14.42	203.94	9.8	1620	1113

** In bales*

Madhya Pradesh has 1st position in total pulses & oilseeds and 3rd position in total food grains production and also has highest producers of Gram, Soybean and Linseed in the country

As regards to the cropping pattern of M.P., the total *kharif* cropped area was 9676.7 thousand ha. and *rabi* cropped area was of 8932.3 thousand ha. In kharif soybean (43.50%) occupied the highest area followed by paddy (17.80%), maize (9.40%), jowar (8.10%), arhar (3.30 %), groundnut (2.20%) and seasmum (1.50%). Wheat (45.4%) occupied the maximum acreage under *rabi* season followed by gram (31.20%), mustard (6.0 %), linseed (1.60%), pulses including lentil (1.10%), and sugarcane (0.8%). (Table 2.7.2)

Table 2..7.2: -Cropping Pattern of Major crops in Madhya Pradesh

Area (000'ha) and Productivity (kg/ha)

Kharif Season				*Rabi* Season			
Crops	Area	% to *Kharif*	Yield	Crops	Area	% to Rabi	Yield
Paddy	1718.8	17.8	1073	Wheat	4051.1	45.4	1921
Jowar	783.3	8.1	781	Gram	2791.3	31.2	931
Maize	909.5	9.4	1593	Pulses including Lentil	986.2	11.0	526
Arhar	315.1	3.3	897	Linseed	143.5	1.6	401
Groundnut	217.7	2.2	931	Mustard	536.7	6.0	978
Seasmum	144.5	1.5	221	Sugarcane	69.5	0.8	43060
Soybean	4212.4	43.5	1064	-	0	0.0	-
Others	1375.4	14.2	-	Others	354	4.0	-
Total Kharif	9676.7	100.0	-	Total Rabi	8932.3	100.0	-
Pc to GCA	52.00				48.00		
Total Gross Cropped Area			18609.0				

2.1.7 Land Holding Pattern:

The average size of holding in the state was of 2.50 ha. The numbers of operation in Madhya Pradesh were 6636 thousands, which covers 16577.90 thousand ha of land. Marginal holding (35.50%) were highest in numbers followed by small (25.43%), semi medium (21.36%), medium (14.61%) and large (3.11%) holding. As regards to the area covered, the medium (34.91%) size holding covers maximum area followed by semi medium (23.70%), large (19.84%), small (14.70%) and marginal (6.85%) size of holding. (Table 2.8)

Table 2.8: Numbers (000') and Area (000'ha) of Operational Holding in M.P.

S.No.	Categories	Numbers	Area	Average size of holding (ha.)
	Marginal (below-1.0 ha)	2355.6 35.50	1135.2 6.85	0.48
2	Small (1-2 ha)	1687.4 25.43	2437.1 14.70	1.44
3	Semi –Medium (2-4 ha)	1417.3 21.36	3929.1 23.70	2.77
4	Medium (4-10 ha)	969.3 14.61	5787.6 34.91	5.97
5	Large (above 10 ha)	206.6 3.11	3288.9 19.84	15.92
	Total	6636.2 100	16577.9 100	2.50

Figures with bold showing percentage to total

2.1.8 Irrigation Potential: -

The irrigation is very limited in the state the net area irrigated is only 56.30 lakh ha. Out of net irrigated area only 1.46 lakh hectares was irrigated more than once. The different sources of irrigation in M.P. are canals, tube-wells, wells and reservoirs, in which canals account for 9.49 lakh ha and wells for 22.33 lakh ha, tube wells for 15.01 lakh ha , tanks for 1.27 lakh ha and others sources for 8.19 lakh ha of irrigated land (Table 2.9.1). As regards to crop wise irrigated area in Madhya Pradesh, wheat had occupied maximum irrigated area (54.60%) followed by gram (21.40%), mustard (3.80%) and (paddy (3.70%) (Table 2.92)**.**

Table.2.9.1 – Source wise irrigated area in M.P. (ha)

Irrigation Sources	Net irrigated Area	Percentage to Total	Gross irrigated Area
1. Wells	2233493	39.67	1534791
2. Canals	949210	16.86	990457
3. Tanks	127210	2.26	131259
4. Tube wells	1501130	26.66	2294458
5. Reservoirs/ others	819838	14.56	825105
Total	5630881	100.00	5776070

Table 2.9.2 : Crop wise irrigated area in Madhya Pradesh

Area (ha)

Crops	Area	Percentage to Total
Wheat	3151051	54.6
Gram	1234626	21.4
Paddy	212320	3.7
Mustard	216714	3.8
Cotton	202335	3.5
Sugarcane	69185	1.2
Barley	37433	0.6
Linseed	4768	0.1
Maize	13663	0.2
Others	633975	11.0
Total Irrigated Area	5776070	100.0

2..1.11 Fertilizers, Bio-Fertilizers and Equipment Use

The total fertilizers consumption was only 39.9 kg/ha in Madhya Pradesh, which was quite low as compared to India (81.8kg/ha.).The consumption of nitrogenous, phosphatic and potassic fertilizers was only 23.30, 14.67 and 1.98 kg/ ha respectively. The bio fertilizer consumptions was also not at satisfactory level, as the farmer of the state consumed only 0.1, 0.1 and 0.2 packets per ha. of *Rhizobium, Azotobactor* and PSB cultures respectively, in their fields. The position of farm machinery is still traditional with local differences in ownerships and operational methods of tractors, iron ploughs and wooden ploughs. At present there are 243145 tractors, 3265161 wooden plough, 577696 iron ploughs, 348334 diesel pumps and 1411640 electrics pumps in the state. (Table 2.10)

Table 2.10: - Fertilizers, Bio-fertilizers consumption (2000-01) and Equipments in Madhya Pradesh

Particulars	Quantity (t)	Kg Per ha
Fertilizer's consumption		
Nitrogenous	606072	23.30
Phosphatic	381679	14.67
Potassic	51520	1.98
Total	1039271	39.95
Bio-fertilizer's	Packets	Packets/ha
Rhizobium	2080778	0.1
Azotobactor	575416	0.1
P. S. B.	3144651	0.2
Total	5800845	0.4
Equipment	Numbers	Per Farm
Tractor	243145	0.019
Wooden Plough	3265161	0.577
Iron Plough	577696	0.049
Diesel Pump	348334	0.19
Electric Pump	1411640	0.116
Sugarcane Crusher Power	7421	
Sugarcane Crusher Bullock	7103	
Bullock Cart	1415305	

2.10 Horticultural status:

In Madhya Pradesh horticultural crops are grown in 577071 ha of land, which was only 1.2 % of the gross cropped area of Madhya Pradesh. Amongst different horticultural crops, vegetables were grown in maximum area 238446 ha (41.3%) followed by spices (37.09%) , fruits (17.72%) aromatic/medicinal (2.70%), and flowers (1.16%) in the state (Table 2.11)

Table: 2.11 Area & Production of different Horticultural Crops

(ha)

Particulars	Area	Percentage to Total
1. Spices	214010	37.09
2. Vegetables	238546	41.34
3. Aromatic/medicinal	15591	2.70
4. Fruits	102237	17.72
5. Flowers	6687	1.16
Total horticultural crops	577071	100

The banana , mango, orange, guava , lime ,papaya , sweet orange and grapes are the main crops in the state, where as the major vegetables which are grown in the state, are potato, tomato, onion, brinjal, ladyfinger, cauliflower, pea, sweet potato and cabbage. The productivity were eight to twenty quintals per ha

2.11 Agri-Export Zones:

The following 5 Agri- export zone are identified by the government for promotion of marketing of produce and fought against the challenges arisen from WTO regime.

Table 2.12 : Agri- Export Zones of Madhya Pradesh

Agri-Export Zones	Districts Covered
Wheat (Sarbati and Durum)	Ujjain, Dewas, Shajapur, Ratlam, Mandsour, Neemuch, Indore, Dhar, Guna, Bhopal, Vidisha, Sehore, Raisen, Hoshangabad , Harda and Narsighnpur
Potato, Onion and Garlic	Dhar, Indore, Dewas, Shajapur, Ratlam, Ujjain, Mandsaur and Neemuch
Seeds Spices, Coriander and Fenugreek	Guna, Ujjain, Rajgarh, Shajapur, Ratlam, Mandsaur and Neemuch
Orange	Chhindwara , Betul and Hoshangabad
Pulses	Vidisha, Raisen, Hoshangabad, Rajgarh, Chhindwara, Narsinghpur, Shivpuri and Guna

2.2 Description of Selected Districts:

2.2.1 MANDSAUR:

Mandsour district falls in *Malwa* Agro climatic region of M.P. It is rich in archaeological and historical heritage. But what makes it famous is the temple of Lord Pashupatinath located on the bank of shivna river. Its idol has parallel only in Nepal. The most common language is Malwi (Rajasthani and Hindi Mixed). It is also famous for large production of Opium around the world. The slate pencil industry is the main industry of the district.

Mandsaur District forms the northern projection of Madhya Pradesh from its western Division, i.e. Ujjain Commissioner's Division. It lies between the parallels of latitude 23^0 45' 50" North and 25^0 2' 55" North, and between the meridians of longitude 74^0 42' 30" East and 75^0 50' 20" East.

The District is bounded by four Districts of Rajasthan, namely Chittorgarh in the west and north,Bhilwara in north, Kota in the north-east and Jhalawar in the east while Ratlam District of Madhya Pradesh bounds it in the South.

The District takes its name from the headquarter's town, Mandsaur. It is considered to have been evolved from Marhsaur, originating from Marh and Saur (or Dasaur, two of the villages which merged in the town. The District is divided into four sub divisions and six tehsils. The sub divisional head quarters are at Mandsaur, Malhargarh, Sitamau and Garoth. Among the tehsils, Malhargarh and Mandsaur lie in the west, arranged from north to south. Similarly Suwasra Bhanpura, Garoth and Sitamau lie in the eastern part.

The District is an average size district of Madhya Pradesh. It extends for about 142 km. from north to south and 124 km. from east to west. The total area is 5521 sq. km. with a population of 1183274 in 2001. The Scheduled Castes population of the District is 212262, Scheduled Tribes 37526.

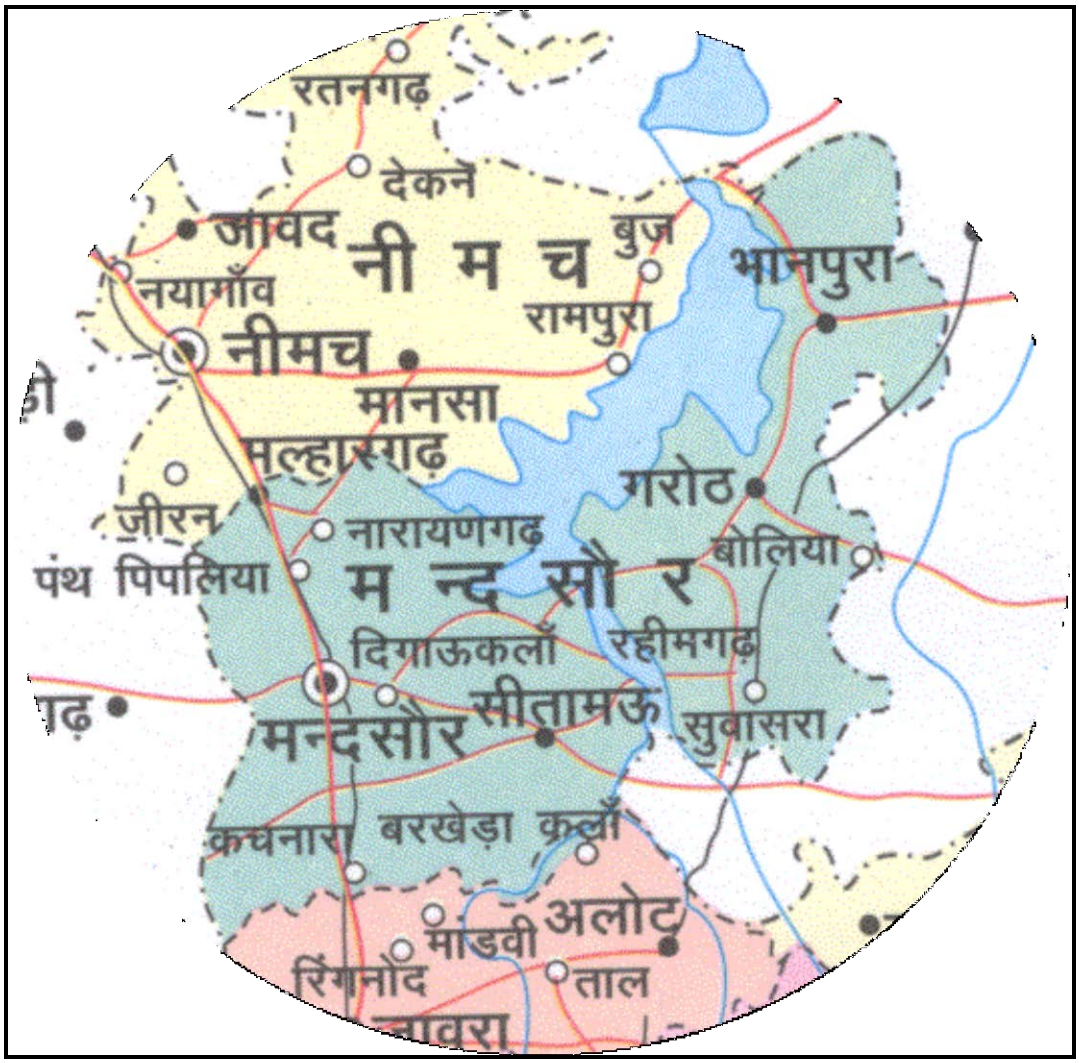


Fig. 2.3: Map of Mandsour District of M.P.

2.2.1.1 Land Use Pattern:

Mandsour occupied total of 551.8 ha of geographical area out of this 68.33 per cent of area is under cultivation and 104.2 ha area is under double cropping. Due to this the cropping intensity of the district is 129.34 per cent. 19 percent of the net area sown is under irrigation. Only 7.04 percent area is under forest, which is very less as compared to the state. (Table 2.12)

Table 2.12: Land use pattern of Mandsour

(Thousand ha)

Particulars	Area	Percentage to Geographical area
Geographical area	551.8	100
Forest area	36.6	6.63
Land not available for cultivation.	122.7	22.24
Uncultivated land.	13.2	2.39
Waste land	19.6	3.55
Fallow land	4.5	0.82
Net area sown	355.2	64.37
Double cropped Area	104.2	
Gross Cropped Area	459.4	
Net area irrigated	67.5	19
Cropping Intensity %	129.34	

*Percentage to Net Area Sown

2.2.1.2 Cropping Pattern:

The cropping pattern is kharif dominated in Mandsour district. Cultivators devoted their 81.41 per cent of gross cropped area under Kharif season. Soybean (59.7%) and Maize (12.2%) are the main kharif crops whereas Wheat (13.65%) and gram (13.2%) are the major *rabi* crops cultivated by the farmers. The cultivators harvested a yield of 2525 kg/ha of maize, 987 kg/ha of groundnut, 719 kg/ha of soybean, 2638 kg/ha of wheat, 690 kg/ha of gram and 670kg /ha of mustard. In *rabi* season Opium is also cultivated in the 3.8 thousand ha (1/10 of ha area by each farmer) in the district under the supervision of the government.

Table 2.13: Cropping pattern of Mandsour district.

(thousand ha)

Kharif Season				*Rabi* Season			
Crops	Area	% to *Kharif*	Yield	Crops	Area	% to Rabi	Yield
Paddy	0	0.0	0	Wheat	33.3	13.6	2638
Jowar	13.9	3.7	545	Gram	32.5	13.2	690
Maize	45.8	12.2	2525	Lentil	1.2	0.5	384
Arhar	1.2	0.3	586	Linseed	2.8	1.1	534
Groundnut	1.5	0.4	987	Mustard	9.3	3.8	670
Seasmum	0.1	0.0	346	Sugarcane	0	0.0	0
Soybean	223.4	59.7	719	Opium	3.8	1.5	-
Others	88.1	23.6	-	Others	2.5	1.0	-
Total Kharif	374	100.0	764	Total Rabi	85.4	34.8	1081
Pc to GCA	81.41				18.59		
Total Gross Cropped Area				459.4			

2.2.1.3 Area & Numbers of Holdings:

The average size of holding in the Mandsour is of 2.22 ha. The numbers of operation holdings in the district are 161.5 thousand, which covers 357.9 thousand ha area of the district. Marginal holding are highest (37.59%) in numbers followed by small (26.44%), semi medium (20.80%), medium (13.44%) and large (1.73%), while medium holding are highest in area (36.80%) followed by semi medium (26.24%), small (17.44%), large (10.59%) and marginal (8.94%) in the district.(Table 2.14)

Table 2.14: Numbers (000') and Area (000'ha) of Operational Holding in Mandsour

S.No.	Category	Numbers	Area	Average size of holding (ha.)
1	Marginal (below-1.0 ha)	60.7	32	0.53
		37.59	8.94	
2	Small (1-2 ha)	42.7	62.4	1.46
		26.44	17.44	
3	Semi –Medium (2-4 ha)	33.6	93.9	2.79
		20.80	26.24	
4	Medium (4-10 ha)	21.7	131.7	6.07
		13.44	36.80	
5	Large (above 10 ha)	2.8	37.9	13.54
		1.73	10.59	
	Total	161.5	357.9	2.22
		100	100	

Figures with bold showing percentage to total

2.2.1.4 Irrigation Potential:

The irrigation is very limited in the district, the net area irrigated is only 19 per cent (67079 ha). The main source of irrigation in the area is by wells (86.42%) and tube wells (6.76%). (Table 2.15.1) Lowered Water table is now problem in the district cultivators are dug their tube well up to the depth of 600m. As regards to crop wise in the district gram had occupied maximum irrigated area (45.5%) followed by wheat (14.10%) and linseed (2.8%). (Table 2.15.2)

Table 2.15.1: Source wise irrigated area in Mandsour.

Irrigation Sources	Net irrigated Area	Percentage to Total	Gross Irrigated Area
1. Wells	57972	86.42	58361
2. Canals	486	0.72	486
3. Tanks	87	0.13	87
4. Tube wells	4536	6.76	4536
5. Reservoirs/ others	3998	5.96	3998
Total	67079	100.00	67468

Table 2.15.2: Crop wise irrigated area in Mandsour. (ha)

Crops	Area	Percentage to Total
Wheat	2405	14.1
Gram	7755	45.5
Paddy	0	0.0
Mustard	6230	36.5
Cotton	67	0.4
Sugarcane	5	0.0
Barley	121	0.7
Linseed	479	2.8
Maize	0	0.0
Others	0	0.0
Total Irrigated Area	17062	100.0

2.2.1.5 HYVs, fertilizer, Bio fertilizer Consumption:

In the district only 8684 ha area is under high yielding varieties seeds. The fertilizer consumption in district is 60.36 kg/ha, which is more than double as compared to the state. The cultivators also used plant protection measures in their crop 28282 ha of area. They used 1.66 liters of plant protection chemicals in their field, which is more than the state average. The farmers also used seed treated material in 17966 ha of area. (Table 2.16)

Table 2.16: - Fertilizers, Bio-fertilizers consumption in Mandsour ha /t.

Particulars	Area	Quantity	Per ha
HYV Seeds	8684	78285	170.41
Chemical Fertilizer	386825	22610	60.36
Plant protection	28282	620	1.66
Seed treatment	17966	52.5	0.14

2.2.1.6 Farm Machinery:

In the Mandsour the cultivators has 6447 tractors in their farms. They used more wooden plough (34034) as compared to the iron plough (80000) in their field. The electrical pumps (79384) are also present more as compared to diesel pump (2010) in the district. 24416 numbers of bullock carts are also present in the district. (Table 2.17)

Table 2.17: Numbers of farm Machinery in Mandsour District.

Equipment	Numbers	Per Farm
Tractor	6447	0.019
Wooden Plough	34034	0.577
Iron Plough	8000	0.049
Diesel Pump	2010	0.19
Electric Pump	79384	0.116
Bullock Cart	24416	

2.2.1.7 Horticultural Status:

In Mandsour district horticultural crops were grown in 49604 ha of net area sown. In which 58.95 per cent is under spices. Coriander & Fenugreek *Jeerea, ajwayan, soff* are the main spices of the district cultivate by the cultivators. Cultivators also devoted their 20.93 per cent, 15.33 per cent and 4.79 per cent area under fruits, medicinal and aromatic, and vegetables crops respectively. (Table 2.18) Mandsour district was also identified by the

government for agri-export zone for Potatoes, Onion & Garlic, Seed Spices (Coriander & Fenugreek).

Table 2.18: Area of different Horticultural Crops in Mandsour

Particulars	Area (ha)	Percentage to Total
1. Spices	29242	58.95
2. Vegetables	2375	4.79
3. Aromatic/medicinal	7606	15.33
4. Fruits	10381	20.93
5. Flowers	0	0.00
Total horticultural crops	49604	100.00

2.2.2 JABALPUR :

Jabalpur is located at the centre of the State of Madhya Pradesh in India, Jabalpur District, is one of thr most important cities in the State. It is situated in the 'Mahakaushal' Region of the State and gets its name from history being the native land of the great 'Jabali Rishi'. The holy 'Narmada' river flows through the District which is the major drinking water source for the District.There is a multipurpose 'Bargi Dam' Project on this river.Known world-over for its 'Marble Rocks' and the 'Dhuandhar' water falls, the tourist site 'Bhedaghat' is also located in the district. The 'Madan Mahal fort' is also located in the district.

The city of Jabalpur was the capital of the erstwhile medieval *Gond* rulers. It is not only an important historical place, but it is also famous for the Marble Rocks gorge on *Narmada* River, near it. It is an administrative and educational center and is the gateway to important wildlife sanctuaries around it. It is one of the largest cities in the Indian state of Madhya Pradesh.The origin of Jabalpur goes back to ancient times. It was then known as Tripuri and was governed by Hayahaya rulers. The ancient Indian epic of Mahabharata has references to his city. It became a part of the great Mauryan and the Gupta Empires. In ad 875, it was taken over by the Kalchuri dynasty who made Jabalpur their capital. In the 13th century, the Gonds seized it and made it their capital. By the early 16th century, it had become the powerful kingdom of Gondwana. From time to time, the Mughal rulers tried to overrun it. The legendary Gond Queen Rani Durgavati died fighting the Mughal forces led by the great Mughal Emperor Akbar. It finally fell to the Marathas in 1789 and was taken over by the British in 1817, when they defeated the Marathas. The British made Jabalpur the

commission headquarters of the Narmada territories and established a cantonment here.

The Jabalpur District has been reconsituted on 25-05-1998. It now has four tehsils Jabalpur, Sihora, Patan and Kundam. There are 07 Blocks in the district with 1449 habited villages, 60 unhabited 1209 revenue village and 04 forest villages. As per Census 2001 Population of the district is 21,67,469.

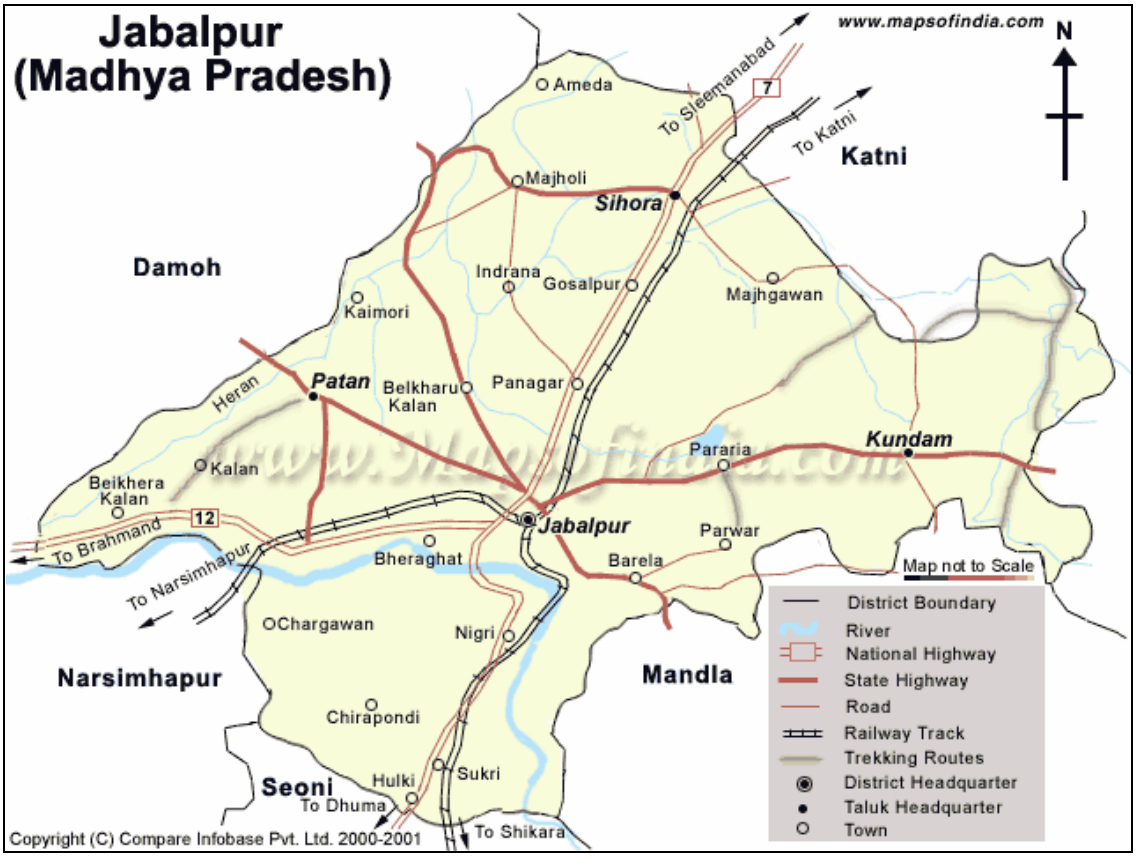


Fig 2.4: Map of Jabalpur District.

2.2.2.1 Land use pattern:

Jabalpur district occupied total of 519.8 ha of geographical area out of this 52.81 per cent of area is under cultivation and 100.1 ha area is under double cropping. Due to this the cropping intensity of the district is 136.47 per cent, which is recorded higher than M.P. the 40.55 percent of the net area sown is under irrigation, which is also higher than

the state . Only 14.95 percent area is under forest, which is very less as compared to the state. (Table 2.19)

Table 2.19: Land use pattern of Jabalpur (2002-03)

Particulars	Area	Percentage to
	(Lakh ha.)	Geographical area
Geographical area	519.8	100.00
1. Forest area	77.7	14.95
2. Land not available for cultivation.	68.8	13.24
3. Uncultivated land.	24.2	4.66
4. Waste land	40.1	7.71
5. Fallow land	34.5	6.64
6. Net area sown	274.5	52.81
7. Double cropped Area	100.1	
8. Gross Cropped Area	374.6	
9. Net area irrigated	111.3	40.55
10. Cropping Intensity %	136.47	

2.2.2.2 Cropping Pattern:

The cropping pattern of Jabalpur is rabi dominated . The Cultivators devoted their 65.54 per cent of gross cropped area under rabi season. Wheat (35.9%) and Gram (24.4%) are the main kharif crops of the rabi season, whereas Paddy (52.2 %) is the major *Kharif* crop cultivated by the farmers. The cultivators harvested a yield of 2314 kg/ha of maize, 1051 kg/ha of groundnut, 932 kg/ha of soybean, 1672 kg/ha of wheat, 1037 kg/ha of gram and 2711 q /ha of Sugarcane .

Table 2.20: Cropping pattern of Jabalpur district.

Kharif Season				*Rabi* Season			
Crops	Area	% to *Kharif*	Yield	Crops	Area	% to Rabi	Yield
Paddy	67.4	52.2	941	Wheat	88.1	35.9	1672
Jowar	4.3	3.3	1226	Gram	59.8	24.4	1037
Maize	4.4	3.4	2314	Pulses including Lentil	34	13.8	488
Arhar	5.4	4.2	1574	Linseed	2.3	0.9	569
Groundnut	0.1	0.1	1051	Mustard	3.2	1.3	680
Seasmum	1.1	0.9	275	Sugarcane	0.1	0.0	2711
Soybean	0.6	0.5	932	-	0	0.0	-
Others	26.5	20.5	-	Others	58	23.6	-
Total Kharif	129.1	100.0	764	Total Rabi	245.5	100.0	1081
Pc to GCA	34.46				65.54		
Total Gross Cropped Area			374.6				

2.2.2.3 Numbers of Holdings:

The average size of holding in the Jabalpur is of 1.62 ha. The numbers of operation holdings in the district are 250.2 thousand, which covers 404.6 thousand ha area of the district. Marginal holding are highest (49.56%) in numbers followed by small (24.18%), semi medium (16.91%), medium (8.31%) and large (1.04%), while medium holding are highest in area (28.97%) followed by semi medium (27.01%), small (19.35%), marginal (14.24 %) and large (10.43%) in the district. (Table 2.21)

Table 2.21: Numbers (000') and Area (000'ha) of Operational Holding in Jabalpur

S. No.	Category	Numbers	Area	Average size of holding (ha.)
1	Marginal (below-1.0 ha)	124 49.56	57.6 14.24	0.46
2	Small (1-2 ha)	60.5 24.18	78.3 19.35	1.29
3	Semi –Medium (2-4 ha)	42.3 16.91	109.3 27.01	2.58
4	Medium (4-10 ha)	20.8 8.31	117.2 28.97	5.63
5	Large (above 10 ha)	2.6 1.01	42.2 10.43	16.23
	Total	250.2 100	404.6 100	1.62

2.2.2.4 Irrigation Potential:

The irrigation is about 40 per cent to the net area sown in the district. The gross irrigated area is 111319 ha, it means about 14 percent area is irrigated twice in a year.. The main source of irrigation in the area is by tube wells (53.69%) and wells (22.97 %). The area irrigated by canals is 8.56 per cent to the total net irrigated area of the district. (Table 2.22.1). As regards to crop wise irrigated in the district wheat had occupied maximum irrigated area (49.5%) followed by gram (29.5 %) and Paddy (2.9%). (Table 2.22.2)

Table 2.22.1: Source wise irrigated area in Jabalpur district.

Irrigation Sources	Net irrigated Area	Percentage to Total	Gross irrigated Area
1. Wells	22402	22.97	22928
2. Canals	8344	8.56	8344
3. Tanks	97	0.10	97
4. Tube wells	52366	53.69	65693
5. Reservoirs/ others	14320	14.68	14587
Total	97529	100.00	111319

Table 2.22.2: Crop wise irrigated area in Jabalpur district. (ha)

Crops	Area	Percentage to Total
Wheat	55129	49.5
Gram	32823	29.5
Paddy	3221	2.9
Mustard	63	0.1
Cotton	0	0.0
Sugarcane	308	0.3
Barley	3	0.0
Linseed	23	0.0
Maize	0	0.0
Others	19749	17.7
Total Irrigated Area	111319	100.0

2.2.2.5 HYVs, Fertilizer, Bio Fertilizer Consumption:

In the district only 23835 ha area is under high yielding varieties seeds. The fertilizer consumption in district is 53.22 kg/ha, which is more than to the state. The cultivators also used plant protection measures in their crop 54310 ha of area. They used on an average 1.08 liters /ha of plant protection chemicals in their field, which is more than the state average. The farmers also used seed treated material in 123300 ha of area.

Table 2.23: - Fertilizers, Bio-fertilizers consumption in Jabalpur ha /t.

Particulars	Area	Quantity	Per ha
HYV Seeds	23835	20600	54.99
Chemical Fertilizer	130650	19937	53.22
Plant protection	54310	405	1.08
Seed treatment	123300	71.33	0.19

2.2.2.6 Farm machinery:

In the Jabalpur the cultivators has 4192 numbers tractors in their farms. They used more wooden plough (43468) as compared to the iron plough (5557) in their field. The electrical pumps (20439) are also present more as compared to diesel pump (1487) in the district. There are 5241 numbers of bullock carts also present in the district. (Table 2.24)

Table 2.24: Numbers of farm Machinery in Jabalpur district.

Equipment	Numbers	Per Farm
Tractor	4192	0.019
Wooden Plough	43468	0.577
Iron Plough	5557	0.049
Diesel Pump	1487	0.19
Electric Pump	20439	0.116
Sugarcane Crusher Power	38	
Sugarcane Crusher Bullock	40	
Bullock Cart	5241	

2.2.2.7 Horticultural Status:

In Jabalpur district horticultural crops were grown in 62532 ha of net area sown. In which 88.30 per cent is under vegetables. Green Pea, Cauliflower, Cabbage, Potato tomato, onion, brinjal, ladyfinger, etc. are the main vegetables of the district. The district has a potential to develop as an agri-export zone for green pea. The Cultivators also devoted their 4.58 per cent, 4.42 per cent and 1.34 per cent and 1.36 percent of total horticultural producing area to fruits, spices, flowers and aromatics and medicinal crops respectively in the district. (Table 2.25)

Table: 2.25: Area & Production of different Horticultural Crops in Jabalpur

Particulars	Area (ha)	Percentage to Total
1. Spices	2762	4.42
2. Vegetables	55216	88.30
3. Aromatic/medicinal	841	1.34
4. Fruits	2861	4.58
5. Flowers	852	1.36
Total horticultural crops	62532	100

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CHAPTER III

RELATIVE ECONOMICS OF MEDICINAL CROPS

This chapter deals with the relative economics of a major medicinal (Isabgol) and a major aromatic (Lemon grass) crop cultivated in Madhya Pradesh. In this chapter emphasis is given to evaluate the economics of cultivation of these particular crops, with their competitive crops i.e. wheat crop in case of Isabgol and paddy - wheat crop sequences in case of lemon grass. An attempt was also made to compare the cost of cultivation of these crops with their competitive crops. The chapter also highlighted the general information of the selected cultivators, their land holding pattern, and cropping pattern who cultivates these crops in the area under study. Thus, the chapter broadly classified on the basis of crops selected for the study as; a) Medicinal Crop: Isabgol and b) Aromatic Crop: Lemon grass.

3.1 Medicinal crop: Isabgol

As discussed earlier Isabgol is the major medicinal crop of the state contributing 30.46 per cent of the total area under medicinal crops. In this sub head general information of the respondents, economics of cultivation of Isabgol and wheat is taken into consideration. An attempt is also made to compare economics of these two crops.

3.1.1 General Information of the Isabgol Growers:

General information of the farmers includes age, size of family, their educational levels, land utilization and cropping pattern of sample respondents.

3.1.1.1 Age & educational levels:

The average Isabgol grower of the area under study has been found in the age group of 45 years and having 7 members in his family. The 98 per cent of Isabgol growers have been found literate. Majority of them have literate up to primary (42.0%) and high school (38.0%). The 12 per cent and 6 per cent of Isabgol growers also holds higher secondary school certificate and bachelor degree respectively. (Table 3.1)

Table 3.1: General features of Isabgol Growers

Particulars	Unit	Total	Percentage
1. Age (Average)	Years	45	
2. Size of the family	Numbers	7	
3. Education Level			
i)Illiterate	Numbers	1	2.0
ii) Literate	Numbers	49	98.0
a)Primary	Numbers	21	42.0
b) High School	Numbers	19	38.0
c) Higher secondary	Numbers	3	6.0
d) Bachelor degree	Numbers	6	12.0
4. Total	Numbers	50	100.0

3.1.1.2 Land Utilization Pattern:

As regards to their land utilization pattern, an average Isabgol grower had used their land resource more intensively as their cropping intensity is found to be 192.11 per cent. His 88.54 per cent area is under irrigation and only 1.80 percent area is under current fellow. (Table 3.2)

Table3.2: Details of Land Holding of Isabgol Growers

Particulars	Area	Percentage to Total
Total Area	4.45	100.00
irrigated Area	3.94	88.54
Un irrigated Area	0.51	11.46
Fallow Land		
a)Current	0.08	1.80
b)Permanent	0	0.00
Pasture land	0.04	0.90
Uncultivated land	0.02	0.45
Net Area Sown	4.31	96.85
Double Cropped area	3.97	
Gross cropped Area	8.28	
Cropping Intensity	192.11	

3.1.1.3 Cropping Pattern:

An average farmer used their land resource both in kharif as well as rabi season in the same proportion. He allocates his 51.59 per cent area in kharif and 48.41 per cent in rabi season. Soybean is found to be a major crop in the area, in which an average Isabgol grower has, allocates his 42.20 per cent of gross cropped area. Wheat (19.51%), gram (7.56%), Isabgol (6.71%), mustard (5.61%), maize (3.78%), cumin (0.85%) are other crops taken by the cultivators. (Table 3.3)

Opium, a narcotic crop also taken by the cultivators of the area selected for the study. This crop is taken by the cultivators in the close monitoring of the state government. An average cultivators allocates his 1.22 per cent (0.10 ha) area under this particular crop. He had been harvested a produce of latex (8 kg/ha) from this particular crop and received rate of Rs. 8000/kg from the government.

Table3.3: Details of Cropping Pattern of Isabgol Growers (ha)

Particulars	Area	Percentage to Gross Cropped Area
Kharif Season	4.23	51.59
Soybean	3.46	42.20
Maize	0.31	3.78
Others	0.46	5.61
Rabi Season	3.97	48.41
Wheat	1.60	19.51
Gram	0.62	7.56
Isabgol	0.55	6.71
Mustard	0.46	5.61
Cumin	0.07	0.85
Opium	0.10	1.22
Others	0.57	6.95
Gross Cropped Area	8.20	100.00

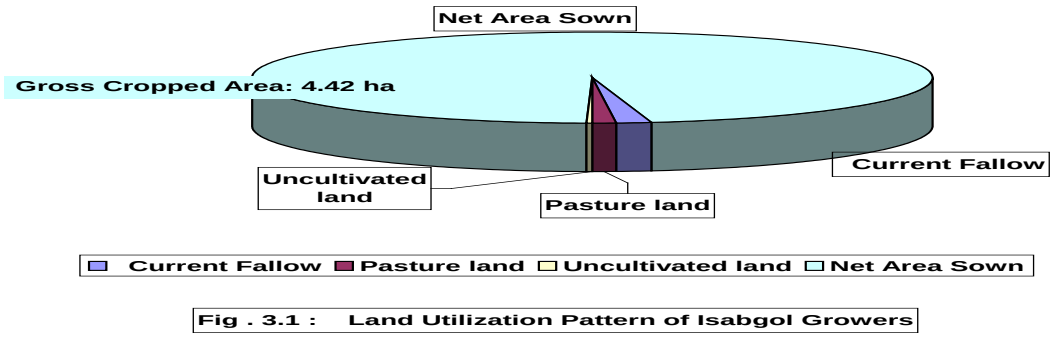

Fig . 3.1 : Land Utilization Pattern of Isabgol Growers

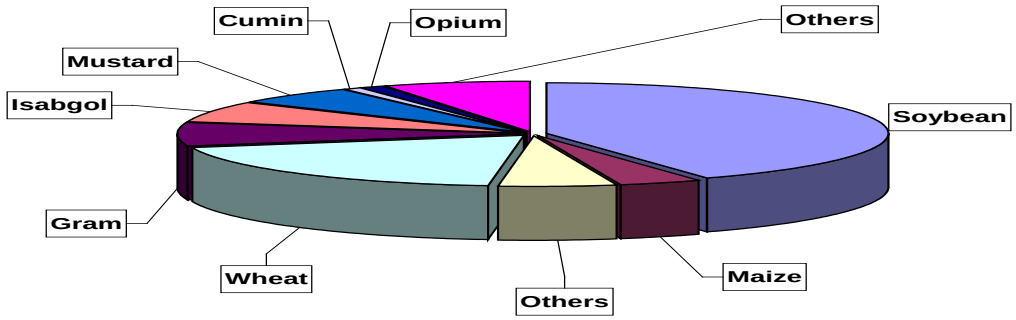

Fig. 3.2 : Cropping Pattern of Isabgol Growers

3.1.2 Cost of Cultivation:

To analyse the cost of cultivation of Isabgol, total variable (operational and input) as well as fixed cost are taken in to consideration.

3.1.2.1 Operational Cost:

Operational cost comprises of labours i.e. human (men and women), bullock labour days and machine hours engaged in the cultivation of Isabgol, presented in Table 3.4.

It is observed from the data that an average Isabgol grower's engaged 36 men, 16 women and 2 bullock labour days per ha in cultivation of Isabgol. He had also applied 16 machine hours per ha to produce Isabgol in his farm. It is also found that he had engaged maximum men labour in harvesting (10 days/ha) followed by processing (7 days/ha),irrigation (6 days/ha), application of chemical fertilizer (top dressing of urea) (3 days/ha each), , sowing, marketing of produce and weeding (2 days/ha each), and transportation & application of FYM in the field (1 days/ha). As regards to women labour he engaged maximum women labour in harvesting (12 days/ha) followed by weeding and processing of produce (2 days /ha each) in the cultivation of Isabgol. Now, bullock power was observed rarely used in the area under study. This power is only used by the cultivators only in transportation of produce and FYM in the field (1 days/ha each). Where as, machine power is now widely used in the cultivation of crops. The 16 machine hours per ha was observed to be used in the cultivation of Isabgol. Amongst, all the operations maximum machine power hours used in land preparation (6 hours/ha) followed by processing of produce (6 hours/ha), sowing (2 hours/ha) , and transportation of produce to the market (1 hours/ha each) in cultivation of Isabgol. The per farm data shows that on an average farmer used 19.80 men, 8.80 women and 1.10 bullock labour days in his farm. He also engaged 8.80 machine hours per farm to cultivate Isabgol in his farm in the area under study. (Table 3.4)

Table 3.4: Details of labour Employed in Cultivation of Isabgol Growers

(ha)

S. No.	Operations	Per hectare				Per Farm			
		M*	W*	Bp*	Mp*	M	W	Bp	Mp
1	Land Preparation	1	0	0	6	0.55	0.00	0.00	3.30
2	FYM-Transportation and Application	1	0	1	0	0.55	0.00	0.55	0.00
3	Sowing	2	0	0	2	1.10	0.00	0.00	1.10
4	Chemical fertilizer	3		0	0	1.65	0.00	0.00	0.00
5	Weeding -manual	2	2	0	0	1.10	1.10	0.00	0.00
6	irrigation	6	0	0	0	3.30	0.00	0.00	0.00
7	Harvesting	10	12	0	0	5.50	6.60	0.00	0.00
8	Processing	7	2	0	6	3.85	1.10	0.00	3.30
9	Packing	2	0	0	0	1.10	0.00	0.00	0.00
10	Transportation	1	0	1	1	0.55	0.00	0.55	0.55
11	Marketing	1	0	0	1	0.55	0.00	0.00	0.55
	Total	36	16	2	16	19.80	8.80	1.10	8.80

M*=Men, W*= Women Bp* = Bullock Power, Mp*= Machine Power

3.1.2.2 Total Cost:

The total cost of cultivation includes variable as well as fixed cost. The details of all these are presented in Table 3.5. It is observed from the data that an average grower of the study area spent Rs. 14760.22 per hectare in the cultivation of Isabgol. In which the total variable cost was found to be 69.91 percent (Rs. 10318.72/ha) of the total cost of cultivation. The remaining 30.09 per cent (Rs. 4441.50) was the total fixed cost. In the total variable cost, the labour cost was found to be constituted the highest, in which an average Isabgol grower spends 68.90 per cent, while other items contributed only 31.10 percent to the total variable cost. Thus, the cultivation of Isabgol in the area has been found labour intensive rather than capital intensive. An average Isabgol grower spends only 11.34 per cent, 9.75 percent, 4.65 percent and 1.39 per cent of the total variable cost incurred in the cultivation of Isabgol on irrigation, fertilizer, seed and FYM respectively. An average cultivator spend more in machine power (Rs. 3750.00/ha) followed by men (Rs. 2200.00/ha), women labour (Rs. 760.00/ha) and bullock labour (Rs.400.00/ha) in the area under study. Thus, the cultivators used more machine power as compared to human and bullock labour. The rental value of land plays an important role in fixed cost, which was 99.07 per cent share of the total fixed cost.

Table 3.5: Total Cost of Cultivation of Isabgol (ha)

S.No.	Particulars	Quantity		Value		Percentage to Total	Percentage to TVC/FC
		Per ha	Per farm	Per ha	Per farm		
A	VARIABLE COST						
1	Seed	20.87	11.48	479.91	263.95	3.25	4.65
2	FYM (tractor trolley)	0.47	0.26	143.34	78.84	0.97	1.39
3	Chemical fertilizer						
a)	Urea	70.67	38.87	367.47	202.11	2.49	3.56
b)	DAP	79.96	43.98	791.56	435.36	5.36	7.67
d)	MOP	2.22	1.22	11.54	6.35	0.08	0.11
4	Total Fertilizer			1170.57	643.81	7.93	11.34
5	Labour						
a)	Men	36	19.80	2200.00	1210.00	14.90	21.32
b)	Women	16	8.80	760.00	418.00	5.15	7.37
c)	Bullock Power	2	1.10	400.00	220.00	2.71	3.88
d)	Machine Power	16	8.80	3750.00	2062.50	25.41	36.34
6	Total Labour			7110.00	3910.50	48.17	68.90
7	Amortized cost of irrigation	3	1.65	1006.00	553.30	6.82	9.75
8	Packing	12	6.60	156.00	85.80	1.06	1.51
9	Interest on working capital			252.90	139.10	1.71	2.45
10	Total Variable Cost			10318.72	5675.30	69.91	100
B	FIXED COST						
11	Rental value of land			4400.00	2420.00	29.81	99.07
12	Depreciation			41.50	22.83	0.28	0.93
13	Total Fixed cost			4441.50	2442.83	30.09	100.00
14	TOTAL COST OF CULTIVATION			14760.22	8118.12	100.00	

3.1.2.3 Returns from Isabgol:

An average cultivator of the area received Rs. 26,400 per hectare from the cultivation of Isabgol. He has received a net return of Rs. 16081.28 per ha on his variable cost, which he spent in the cultivation of Isabgol. When considered the total cost of cultivation, it is found that on an average a cultivators received a net return of Rs. 11639.78 per ha from the cultivation of Isabgol in the area under study. He has been able to got Rs. 2.56 and Rs. 1.79 on the investment of Rs. 1.00 over variable and total cost respectively. Thus, the cultivation of Isabgol has been found to be a profitable combination of the crop rotation prevailed in the area under study.(Table3.6)

Table 3.6: Returns from Cultivation of Isabgol (ha)

S. No.	Particulars	Quantity		Value	
		Per ha	Per farm	Per ha	Per farm
1	Yield of main product	12	6.60		
2	Price per kg	2200	1210.00	26400	14520.00
3	Yield of byproduct				
4	Price per kg				
5	Gross return			26400	14520.00
6	Total variable cost of cultivation			10318.72	5563.88
7	Total cost of cultivation			14760.22	8006.71
8	Net Return:				
a)	Over variable cost			16081.28	8956.12
b)	Over total cost			11639.78	6513.29
9	Cost of Production /q				
a)	Over variable cost/q			859.89	
b)	Over total cost/q			1230.02	
10	Return per Rupee				
a)	Over variable cost			2.56	
b)	Over total cost			1.79	

3.1.3 Competing Crop of Isabgol: Wheat

As discussed earlier that Isabgol is the competing crop to wheat. The cultivators of the study area shifted the some area of wheat in Isabgol. Though, all the selected Isabgol growers have also grown Isabgol and wheat hence, the data related to cost of cultivation of wheat also collected from the same respondents.

3.1.3.1 General Features of Wheat:

The consumption of wheat *(Triticum aestivum)* in the form of flour and bread has recently increased significantly in the tropical regions. Wheat is the world's number one cereal crop in 2001 it was grown on about 214 million ha, which is about 14 per cent of the global arable land area. Although the area under wheat has remained static around 220 million ha, its production has increased from 355 million tonnes in 1975 to 578 million tonnes in 2001 due to development of better varieties and improved production practices. As a contrast to paddy, which is mostly grown in Asia, wheat is grown in all the six continents of the world. The India has the largest area under wheat, while the China ranks first in the total production of wheat. However in productivity of India

,China and Russia are much behind the European Countries. The India, occupies a distinct position. Although area under wheat is about 61.00 per cent of that under paddy, it was this crop that brought in the green revolution in India and paved way for the country's food security. The introduction of Mexican dwarf wheat varieties in the mid-sixties revolutionized the wheat productivity as well as its total production in India. Wheat contributes remarkable share in the Green Revolution.

In India, wheat is grown in almost all the states in northern and central India. Uttar Pradesh ranks first in area and total production, while Punjab ranks first in productivity. One of the major factors responsible for higher productivity in Punjab is that almost 100 per cent area under wheat is irrigated. The other factor responsible for good yields of wheat in Punjab is very high level of fertilizer application.

Madhya Pradesh contributed 14.0 per cent share of area and 7.0 per cent share of production of India's total areas and production. In Madhya Pradesh wheat is concentrated particularly in the Central Narmada Valley and the Vindhyan Plateau agro-climatic regions. Narsinghpur, Hoshangabad, Sehore, Raisen , Bhopal, Sagar, Damoh, Vidisha and Guna are the major wheat growing districts of the state. Ujjain, Dewas, Shajapur, Ratlam, Mandsaur, Neemuch, Indore, Dhar, Khargone, Guna, Sehore, Vidisha, Raisen, Hoshangabad, Harda and Narsinghpur. districts are also indentified under Agricultural export zone for Wheat in Madhya Pradesh. The most important cultivated species of the wheat are Triticum aestivum (Hexaploid) and Tritium durum (Tetraploid). In general, the maximum productivity potential of high yielding semi-dwarf wheat varieties under irrigated conditions is attained by sowing them between the 10^{th} and 25^{th} of November in all the zones. Rainfed wheat is generally sown during the period from the second fortnight of October to early November.

In India wheat is ground to prepare flour which is mainly consumed bread (chapati). Its flour is also used to prepare fried chapatis called Puris and Parantha and most important uses are to prepare backing bread, Pastry and biscuits. It is also used for the production of semolina for the macaroni industry and for preparing break fast foods.

Varieties of durum wheat having large white Kernels are often used for puffing.Wheat straw makes an important fodder, while by-products of wheat flour mills,

particularly bran are used as cattle feed. Among the industrial uses of wheat, the production of starch for the paper industry is important.

The chemical composition of wheat grain determines its nutritional quality, Broadly wheat grain has the following composition. Wheat contains 60 – 68 per cent of starch, 08 - 15 per cent of protein,1.5 – 2.0 per cent of fat, 2.0 – 2.5 per cent of cellulose and 1.5 – 2.0 per cent of minerals. Besides the above constituents, wheat grain also contains vitamins A, B, B_2, nicotinic acid and vitamin E. The essential amino acids viz isoleucine, leucine, lysine, methionine, phenylamine, thyceonine and voline are contained in the range of 26- 30 per cent of total amino acids.

3.1.3.2 Cost of Cultivation:

Wheat is the major crop of the area grown by the sample respondents and it account for 20 per cent of gross cropped area. It is the second major crop of the area after soybean.

3.1.3.2.1 Operational Cost:

The operational cost of wheat is presented in Table 3.7.It is observed from the data that an average wheat grower's engaged 38 men, 23 women and 2 bullock labour days per ha in cultivation of crop. He also engaged 20 machine hours per ha to produce wheat. It is also found that he had engaged maximum men labour in irrigation (10 days/ha) followed by harvesting (9 days/ha), processing (6 days/ha), application of chemical fertilizer (3days/ha), sowing, packing and weeding (2 days/ha each), land preparation , transportation and application of FYM, transportation and marketing of produce and weeding (1 days/ha each). As regards to women labour, he engaged maximum women labour in harvesting (16 days/ha) followed by processing of produce, and weeding (2 days /ha each) in the cultivation of wheat. Now, bullock power is rarely used in the area under study. This power is only used by the cultivators only in transportation of produce and FYM in the field and transportation of produce to the market (1 days/ha each). Where as machine power is now widely used in the cultivation, 20 machine hours per ha observed to be used in the cultivation of crop. Amongst all the operations in cultivation of wheat, maximum machine power hours used in land preparation (6 hours/ha) followed by processing of produce (10 hours/ha), sowing (2 hours/ha) , and transportation of produce and marketing of produce to the market (1

hours/ha each). On the per farm basis an average farmer used 71.28 men, 37.26 women and 3.24 bullock labour days in his farm. He also engaged 38.88 machine hours per farm to cultivate wheat in the area under study.

Table 3.7: Details of labour Employed in Cultivation of Wheat Growers (ha)

S. No.	Operation Wise Labour	Per hectare				Per Farm			
		M	W	Bp	Mp	M	W	Bp	Mp
1	Land Preparation	1	0	0	6	1.62	0.00	0.00	9.72
2	FYM/ Compost-Transportation and Application	1	0	1	0	1.62	0.00	1.62	0.00
3	Sowing	2	0	0	2	3.24	0.00	0.00	3.24
4	Chemical fertilizer	3	0	0	0	4.86	0.00	0.00	0.00
5	Weeding -manual	2	2	0	0	3.24	3.24	0.00	0.00
6	irrigation	10	0	0	0	16.20	0.00	0.00	0.00
7	Harvesting	9	16	0	0	14.58	25.92	0.00	0.00
8	Processing	6	2	0	10	9.72	3.24	0.00	16.20
9	Packing	2	0	0	0	3.24	0.00	0.00	0.00
10	Transportation	1	0	1	1	1.62	0.00	1.62	1.62
11	Marketing	1	0	0	1	1.62	0.00	0.00	1.62
	Total	38	23	2	20	71.28	37.26	3.24	38.88

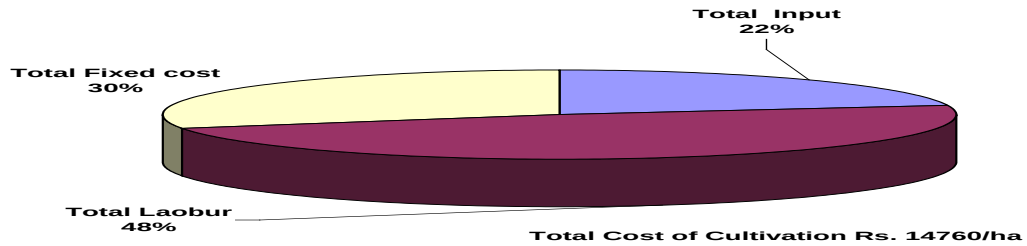

Fig. 3.3 : Cost of Cultivation of Cultivation of Isabgol

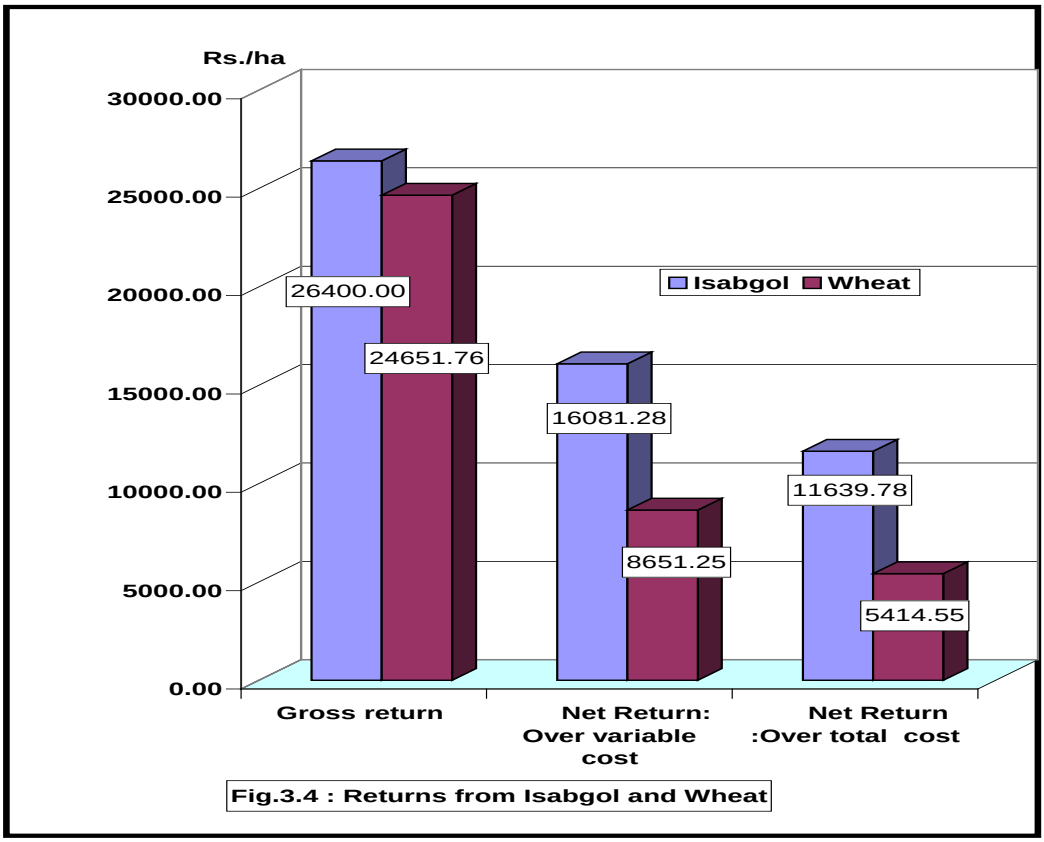

Fig.3.4 : Returns from Isabgol and Wheat

3.1.3.2.2 Total Cost:

. The detail of the total cost of cultivation of wheat is presented in table 3.8. It is observed from the data that an average grower of the study area spent Rs. 16798.81 per hectare in the cultivation of wheat. The total variable cost was found to be 80.73 percent (Rs. 13562.11/ha) to the total cost of cultivation. The remaining 19.27 per cent (Rs. 3236.70/ha) was the total fixed cost. In the total variable cost, the labour cost was the highest (61.46 %), while remaining other items contributed only 38.54 percent to the total variable cost. Thus, the cultivation of this crop was labour intensive rather than capital intensive. An average farmer spent only 15.37 per cent, 9.26 percent, 8.24 percent and 2.62 per cent in irrigation, seed, fertilizer, and packaging of produce respectively to the total variable cost incurred in the cultivation of wheat. Amongst all labours used in the cultivation of crop, an average cultivator spend more in machine power (Rs. 5000.00/ha) followed by men (Rs. 1900.00/ha), women labour (Rs. 1035.00/ha) and bullock labour

(Rs.400.00/ha) in the area under study. Thus, the wheat cultivators used more machine power as compared to human and bullock labour. The rental value of land (Rs.3195.20) plays an important role in fixed cost, which was found to be 98.72 per cent share of the total fixed cost.

Table 3.8: Economics of Cultivation of Wheat (ha)

S. No.	Particulars	Quantity		Value		Percentage to Total	Percentage to TVC/FC
		Per ha	Per farm	Per ha	Per farm		
A	VARIABLE COST						
1	Seed	125.6	203.52	1256.30	2035.21	7.48	9.26
2	FYM(tractor trolley)	0.47	0.76	143.34	232.21	0.85	1.06
3	Chemical fertilizer						
a)	Urea	68.24	110.55	354.85	574.85	2.11	2.62
b)	DAP	72.56	117.55	718.34	1163.72	4.28	5.30
d)	MOP	8.56	13.87	44.08	71.42	0.26	0.33
4	Labour						
a)	Men	38	61.56	1900.00	3078.00	11.31	14.01
b)	Women	23	37.26	1035.00	1676.70	6.16	7.63
c)	Bullock Power	2	3.24	400.00	648.00	2.38	2.95
d)	Machine Power	20	32.40	5000.00	8100.00	29.76	36.87
	Total Labour			8335.00	13502.70	49.62	61.46
5	Amortized cost of irrigation	5	8.10	2085.00	3377.70	12.41	15.37
6	Packing material, packing ,loading, transportation	30	48.60	355.80	576.40	2.12	2.62
7	Interest on working capital (10 % per annum for crop season)			269.39	436.41	1.60	1.99
8	Total Variable Cost			13562.11	21970.61	80.73	100
B	FIXED COST						
9	Rental value of land			3195.20	5176.22	19.02	98.72
10	Depreciation			41.50	67.23	0.25	1.28
11	Total Fixed cost			3236.70	5243.45	19.27	100.00
12	TOTAL COST OF CULTIVATION			16798.81	27214.07	100.00	

3.1.3.2.3 Returns from Wheat:

The cultivation of wheat provided income of Rs. 24651.76 per hectare to an average cultivator of the study area. He had received a net return of Rs. 8651.25 per ha on his variable cost, which he spend in its cultivation. When considered the total cost of cultivation, it is found that on an average a cultivators received a net return of Rs. 5414.55 per ha from the cultivation of wheat in the area under study. It is also found that on the investment of Rs. 1.00, he has been able to get Rs. 1.82 and Rs. 1.47 respectively over variable and total cost (Table 3.9) . Thus, the cultivation of wheat is found to be a profitable combination of the crop rotation prevailed in the area under study.

Table 3.9: Returns from Cultivation of Wheat (Rs.)

S. No.	Particulars	Quantity		Value	
		Per ha	Per farm	Per ha	Per farm
1	Yield of main product	32.86	53.23		
2	Price per kg	676		22213.36	35985.64
3	Yield of byproduct	30.48	49.37		
4	Price per kg	80		2438.4	3950.21
5	Gross return			24651.76	39935.85
6	Total variable cost of cultivation			13562.11	21970.62
7	Total cost of cultivation			16798.81	27214.07
8	Net Return:				
a)	Over variable cost			8651.25	14015.03
b)	Over total cost			5414.55	8771.57
9	Cost of Production /q				
a)	Over variable cost/q			263.28	
b)	Over total cost/q			164.78	
10	Return per Rupee				
a)	Over variable cost			1.82	
b)	Over total cost			1.47	

3.1.4 Isabgol Vs Wheat:

An attempt has also been made to compare the cost and returns of Isabgol and wheat in the area under study and data related to these are presented in table 3.10.

Table 3. 10: Comparative Cost & Returns of Isabgol and wheat (Rs/ha)

S. No.	Particulars	Isabgol	Wheat	Percentage Difference over Isabgol
A	COSTS			
1	Total Input	3208.72	5227.11	-62.90
2	Total Labours	7110.00	8335.00	-17.23
3	Total Variable Cost	10318.72	13562.11	-31.43
4	Total Fixed cost	4441.50	3236.70	27.13
5	Total Cost of Cultivation	14760.22	16798.81	-13.81
B	RETURNS			
1	Gross return	26400.00	24651.76	6.62
2	Net Return:			
a)	Over variable cost	16081.28	8651.25	46.20
b)	Over total cost	11639.78	5414.55	53.48
3	Cost of Production /q			
a)	Over variable cost	859.89	263.28	69.38
b)	Over total cost	1230.02	164.78	86.60
4	Return per Rupee			
a)	Over variable cost	2.56	1.82	28.86
b)	Over total cost	1.79	1.47	17.81

An average cultivator of the area received 46.20 per cent and 53.48 per cent more net return per ha over variable cost and total cost from cultivation of Isabgol over wheat. It is also clear from the data that an average farmer invested 13.81 per cent less in cultivation of Isabgol than the wheat but received 53.48 per cent more net income as compare to wheat. On investment of Rs. 1.00 an average grower received Rs. 2.56 over the variable cost and Rs. 1.79 over the total cost for cultivation of Isabgol, while he received only Rs.1.82 at variable cost and Rs.1.47 over total cost from cultivation of wheat in the area under study. Thus, the cultivation of Isabgol crop is more profitable than that of wheat the resource limitation, as Isabgol is more profitable and low cost venture.

3.1.5 Recommended Package Vs Farmer's Practices

An attempt has also been made to know the extent of recommended package of practices of Isabgol adopted by the cultivators in their field. The cost of cultivation of farmers' field has also been made to compare with the research farm data for this. The data related to research farm were obtained from the College of Horticulture, Mandsour. It is for analyzing the fact that at what extent Isabgol growers adopted the recommended package of practices in their farm. The data related to these are presented in the Table 3.11. As the fixed cost was same for the same situation, hence fixed cost is considered as constant for both the situation and treated as constant. Only variable cost is taken under consideration for comparing both the situation i.e. farmer's practices and RPP.

It is observed from the data that an average Isabgol grower invested less than 6.97 per cent on variable cost than the RPP in his field. He has been invested more in seed, bullock labour, machine hours than RPP while less in manures and fertilizer, human labour, and irrigation. While surveying from the cultivators, it was found that the cultivators of the study area used 5 times more seed rate as compared to RPP. As they have been followed broadcasting method of sowing, while scientists are recommended the line sowing.

They have not been using the recommended variety (Jawahar Isabgol -4) in their fields and used the 8 year old seed of the Isabgol, which was brought by their relatives from the Gujarat state. They have been used imbalance fertilizer in their field (more nitrogenous fertilizer) with out testing their soil. None of the farmer was found who tests their soil from the soil-testing lab because they haven't faith of soil testing report.

Table 3.11: Comparative Cost and Return Analysis of Farmer's Practice with Recommended Package of Practices (Rs/ha)

S. No.	Particulars	Farmers Practices	RPP*	Difference from RPP	Percentage difference to RPP
A	VARIABLE COST				
1	Seed	479.91	210.00	269.91	128.53
2	Manures and fertilizers	1313.91	1558.00	-244.09	-15.67
a)	Human labour	2960.00	3115.00	-155.00	-4.98
c)	Bullock Power	400.00	0.00	400.00	
d)	Machine Power	3750.00	3050.00	700.00	22.95
5	Total Labour	7110.00	6165.00	945.00	15.33
6	Amortized cost of irrigation	1006.00	1250.00	-244.00	-19.52
7	Packing material	156.00	196.00	40.00	-20.41
8	Interest on working capital	252.90	307.00	-54.10	-17.62
9	Total Variable Cost	10318.72	9686.00	632.72	6.53
D	RETURNS				
1	Gross return	26400	33000.00	-6600.00	-20.00
2	Net Return Over variable cost	16081.28	23314.00	6435.28	66.71
3	Cost of Production /q Over variable cost	859.89	645.73	214.16	33.17
4	Return per Rupee Over variable cost	2.56	3.41	-0.85	

* **Recommended Package of Practices**

Due to all these fact an average Isabgol grower's got 20 per cent less gross income (Rs.26400/ha), 44.98 per cent less net income (16081.28/ha) and less per rupee return (Rs. 2.56) on investment of Rs.1.00 from the RPP. His cost of production of producing 1 quintal of Isabgol had been increased from 645.73/q (RPP) to 859.89/q in the area under study.

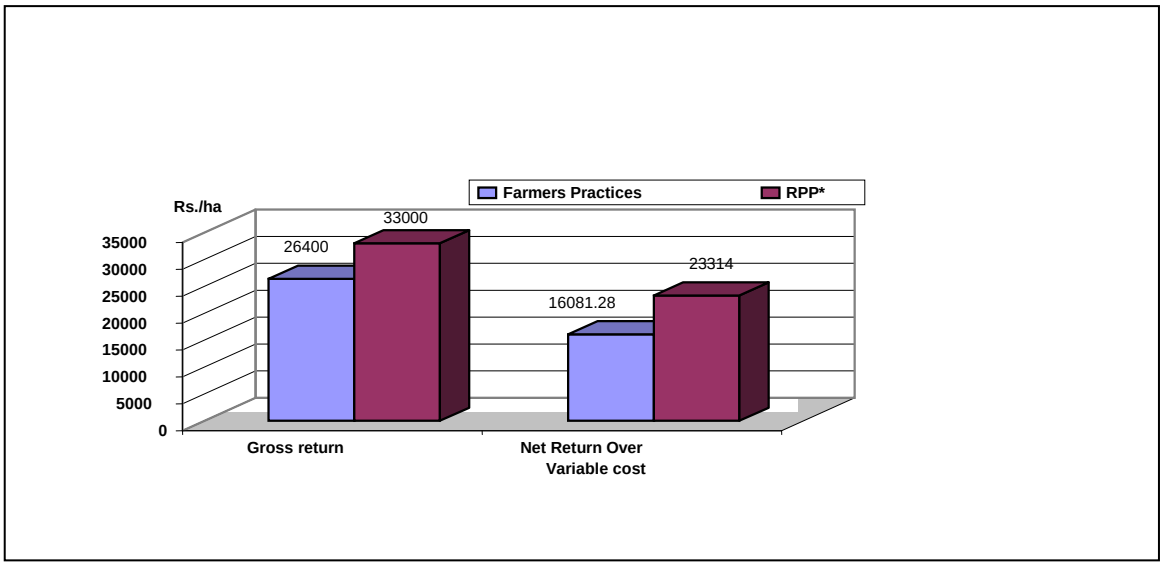

Fig. 3.5 : Farmer's Practice Vs Recommended Package

3.1.6 Problems in Cultivation:

The problems that are faced by the Isabgol growers in the area under study are presented in Table 3.12. It is observed from the data that the cent per cent Isabgol growers reported that they have one and only one problem in cultivation of Isabgol in the area under study that of unfavorable weather conditions at the time of maturity of crop. They told that if the rains are occurred at the time of maturity of crop they have been lost their whole produce. As the grain of Isabgol has a quality of absorbing moisture. This is the only problem that they faced while cultivation of the crop. The other problems that they faced were not specifically related only to Isabgol. These are the general problems, which were related to all crops including Isabgol.

Table 3.12: Problems Faced by growers in cultivation of Isabgol

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Lack of technical know how	27	54	23	46	0	0	0	0	0	0	0	0	0	0
Lack of Capital	0	0	0	0	4	8	4	8	7	14	15	30	20	40
Lack of Credit facilities	0	0	0	0	0	0	0	0	6	12	10	20	34	68
Non availability of desired input	26	52	12	24	10	20	2	4	0	0	0	0	0	0
Problem of Electricity at	25	50	13	26	4	8	3	6	2	4	2	4	1	2

the time of peak operation period														
Lack of Skilled labour at peak operation period	28	56	21	42	1	2	0	0	0	0	0	0	0	0
Non availability of superior quality of inputs	8	16	23	46	11	22	2	4	3	6	1	2	2	4
Unfavorable weather conditions	50	100	0	0	0	0	0	0	0	0	0	0	0	0

The other problems, which were reported by the more than 50 per cent respondents and treated them at first ranked were lack of technical know how (54%), non availability of desired input (52%), problem of electricity at the time of peak operation period (50%) and lack of skilled labour at peak operation period (56%). The majority of other respondents also ranked these problems at second rank.

The problems that were ranked by the respondents at 7th ranked and are reported by more than 40 per cent of respondents were lack of capital (40%) and lack of credit facilities (68%).

Hence, the majority of respondents reported the risk at the time of harvesting. Thus, for increasing the area of the crop in Isabgol producing area, the crop should be considered under the crop insurance scheme. Efforts should also be taken up for strengthen the extension wings of the state government in true sense.

3.2 Aromatic Crop: Lemon Grass

The Lemongrass is the major aromatic crop of the state contributing about 60 per cent area of total aromatic crops. The general information of the respondents and economics of cultivation of Lemongrass and paddy- wheat system is taken in to consideration in this sub head. An attempt is also made to compare the economics of these two crops.

3.2.1 General Information of the Lemongrass Growers

In the general information of the respondents about age, size of family, their educational status, land utilization and cropping pattern of respondents considered. There details are as follows.

3.2.1.1 Age and Education Levels

The average age of Lemongrass growers was found to be 42 years and having 5 members in their family. There literacy level was found 100 per cent and majority of them were literate up to primary (38.0 per cent) and high school (26 per cent). The 22 per cent and 14 per cent of Lemongrass growers had also holds higher secondary school certificate and bachelor degree respectively (Table 3.13).

Table 3.13 General features of Lemongrass growers

Particulars	Unit	Total	Percentage
Age (Average)	Years	42	
Size of family	Numbers	05	
Educational level			
(i) Illiterate	Numbers	00	0.0
(ii) Literate	Numbers	50	100.0
a) Primary	Numbers	19	38.0
b) High school	Numbers	13	26.0
c) College	Numbers	11	22.0
d) Degree	Numbers	07	14.0
Total Educational level	Numbers	50	100.00

3.2.1.2 Land Utilization Pattern

As regards to their land holding pattern of the selected Lemongrass growers is concerned, An average Lemongrass grower's had used their land resources more intensively, as their cropping intensity was found to be 199.05 per cent. His 91.09 per cent area was under irrigation and only 8.91 per cent area of their size of holding was found rainfed (Table 3.14).

Table 3.14 Details of land holding of Lemongrass growers (ha.)

Particulars	Area	Percentage
1. Total Area	7.52	100.00
2. Irrigated area	6.85	91.09
3. Un-irrigated	0.67	8.91
4. Fallow Land		
Current	0.10	1.33
Permanent	0.00	0.00
5. Pasture land	0.06	0.80
6. Uncultivated land	0.02	0.27
7. Net area Sown	7.34	97.60
8. Double Cropped Area	7.27	
9. Gross Cropped Area	14.61	
10. Cropping Intensity	199.05	

3.2.1.3 Cropping Pattern

An average farmer used their land resources both in kharif as well as *rabi* season in the same proportion. (Table 3.15) They devoted their 49.66 per cent of land area in *kharif* and 50.34 per cent area in *rabi* season. Paddy was found to be a major kharif crop in the area (28.96 per cent) and other crops contributing very meager area like in Jowar (2.94 per cent), maize (2.18 per cent) and medicinal and aromatic crop (10.52 per cent). Lemongrass only contributing 2.73 per cent area in kharif and *rabi* season. The selected growers also taking vegetable crop in both the season (*kharif and rabi*) due to nearness of urban market to fetch the better price. In *rabi* season cereals are wheat which such the major crop contributing (29.37 per cent) and in case of pulses gram which contributing (6.69 per cent).

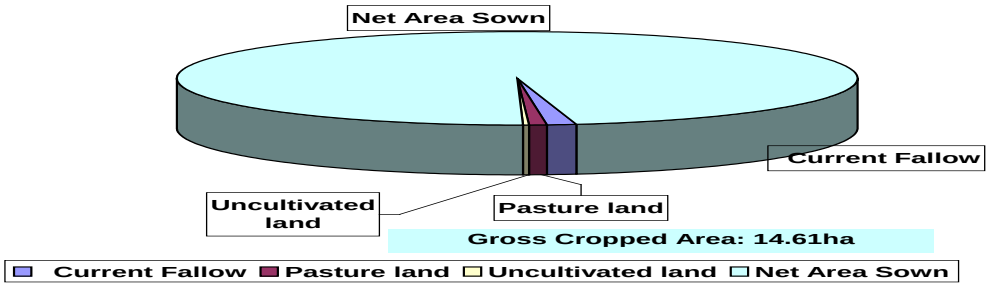

Fig . 3.6 : Land Utilization Pattern of Lemon grass Growers

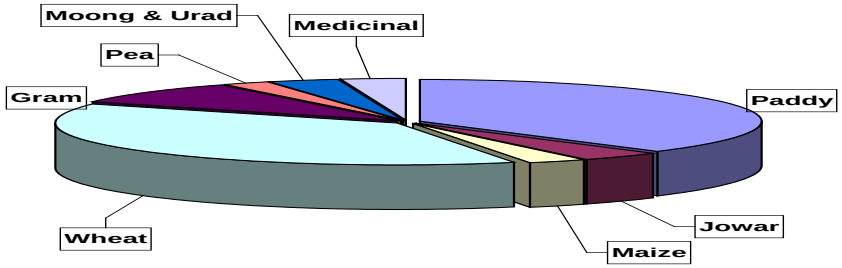

Fig. 3.7: Cropping Pattern of Lemongrass Growers

Table 3.15 Details of cropping pattern of Lemongrass growers (ha.)

Particulars	Area	Percentage
Kharif season		
Paddy	4.24	28.96
Jowar	0.43	2.94
Maize	0.31	2.12
Moong and Urad	0.38	2.60
Medicinal and Aromatic Crops		
Safed Musali	0.33	2.25
Lemongrass	0.44	2.73
Colius	0.45	3.07
Jatropha	0.36	2.46
Others (vegetables)	0.37	2.53
Rabi Season		
Wheat	4.30	29.37
Gram	0.98	6.69
Pea	0.25	1.71
Medicinal and Aromatic Crops		
Lemongrass	0.40	2.73
Colius	0.45	3.07
Jatropha	0.36	2.46
Others (Vegetable)	0.37	2.63
Gross Cropped Area	14.64	100.00

3.2.2 Cost of Cultivation

To analyse the cost of cultivation of lemongrass total variable (operational and input) as well as fixed cost are taken up for analysis. As lemon grass is a perennial crop having duration of approximately. But due to various problems in its cultivation and marketing, an average cultivator of the study area uprooted the crop only in 3 years. Hence, the analysis was done only for the 3 years from the collected primary data from lemongrass growers and their mean is considered for interpretation.

3.2.2.1Operational Cost

In operational cost all the labours human days (man and women), bullock days and machine hours engaged in the cultivation of Lemongrass in a hectare of land and in a farm are taken in to consideration and presented in table 3.16.

It is observed from the data that an average Lemongrass grower's engaged 61 men days and 49 women days and 22 machine hours per hectare to produce Lemongrass

in their farm. It was also found that he had engaged maximum men labour in harvesting and in transportation (15 days/ ha) followed by transportation and irrigation, chemical fertilizer (3 days/ha), FYM application (2 days/ha) and land preparation

Table 3.16:Details of labour Employed in Cultivation of Lemon Grass Growers (ha)

S. No.	Operation Wise Labour	Per hectare				Per Farm			
		M	W	Bp	Mp	M	W	Bp	Mp
1	Land Preparation	1	0	0	9	0.40	0.00	0.00	3.60
2	Fym/ Compost-Transportation and Application	2	2	0	4	0.80	0.80	0.00	1.60
3	Transplanting	15	15	0	0	6.00	6.00	0.00	0.00
4	Chemical fertilizer	3	2	0	0	1.20	0.80	0.00	0.00
6	irrigation	12	0	0	0	4.80	0.00	0.00	0.00
7	Harvesting	15	30	0	0	6.00	12.00	0.00	0.00
10	Transportation	13	0	0	9	5.20	0.00	0.00	3.60
	Total	61	49	0	22	24.40	19.60	0.00	8.80

(1 day/ ha). As regards to women labour is concerned, he engaged maximum in harvesting (30 days/ha) followed by transplanting of slips in the field (15 days/ha), application of FYM (2 days/ha) and chemical fertilizer (2 days/ha) No bullock power were used in the cultivation of Lemongrass where as machine power is now widely used in the cultivation 22 hrs machine power per ha is observed to used in the cultivation of Lemongrass. Among all the operations, the maximum machine power hours used in land preparation and transportation (9 hrs/ha) followed by application of FYM (4 hrs/ha) in cultivation of Lemongrass As regards to the per farm consideration, an average farmer used 24.40 men, 19.60 women labour days in their farm. They engaged 8.80 machine hours per farm to cultivate lemongrass in their farm in the area under study.

3.2.2.2Total Cost:

The total cost of cultivation includes variable and fixed cost. As the lemongrass oil is the final product of lemongrass. Hence the processing cost of lemongrass to produce oil is also taken into consideration and details of it are presented in Appendix1.3. The details of these costs are presented in Table 3.17. As the data in the table shows that on average grower of the study area spent Rs.35599.46 per hectare (total cost) in the cultivation of lemongrass. Among total cost, total variable cost was found to be 83.14 per cent (Rs.29596.46/ha) and the remaining 16.86 per cent (Rs.6003.00) was the total

fixed cost. Among the total variable cost, the contribution of planting material was found highest (33.70 per cent) followed by labour (32.61 per cent) irrigation (9.46 per cent), packing material and transportation (1.69 per cent) and FYM given to the land (1.25 per cent). An average cultivator spent more in machine labour (Rs.4950.00/ha.) followed by men

Table 3.17: Economics of cultivation of lemon grass. (Rs.)

Particulars	Quantity		Value		Percentage to Total	Percentage to TVC
	Per ha	Per farm	Per ha	Per farm		
VARIABLE COST						
Planting Material	49870.00	19948.00	9974.00	3989.60	28.02	33.70
Fym (tractor trolley)	3.71	1.48	371.00	148.40	1.04	1.25
Chemical fertilizer		0.00		0.00	0.00	
Urea	153.00	61.20	780.30	312.12	2.19	2.64
DAP	57.00	22.80	561.45	224.58	1.58	1.90
MOP	32.00	12.80	149.12	59.65	0.42	0.50
Labour						
Men	61.00	24.40	2745.00	1098.00	7.71	9.27
Women	49.00	19.60	1960.00	784.00	5.51	6.62
Bullock Power	0.00	0.00	0.00	0.00	0.00	0.00
Machine Power	22.00	8.80	4950.00	1980.00	13.90	16.72
Total Labour						
Amortized cost of irrigation	6.00	0.00	2800.00	1120.00	7.87	9.46
Processing Cost	91.80	36.72	2115.00	846.00	5.94	
Packing material, packing, loading, transportation			500.00	200.00	1.40	1.69
Interest on working capital			2690.59	1076.24	7.56	9.09
Total Variable Cost			29596.46	11838.58	83.14	100
FIXED COST						
Rental value of land			5508.00	2203.20	15.47	91.75
Depreciation			495.00	198.00	1.39	8.25
Total Fixed cost			6003.00	2401.20	16.86	100.00
TOTAL COST OF CULTIVATION			35599.46	14239.78	100.00	

(Rs.2745.00/ha) women labour (Rs.1960.00/ha) in the area under study. It was found that Lemongrass grower used more machine labours as compared to human labour. As regards the fixed cost of rental value of land plays an important role in the cultivation which was found to be 91.75 per cent of the total fixed cost. An average lemongrass grower spent Rs. 2115.00 as a processing cost of lemon grass oil which is nearly found to be 6.00 per cent of the total cost of cultivation in the area under study.

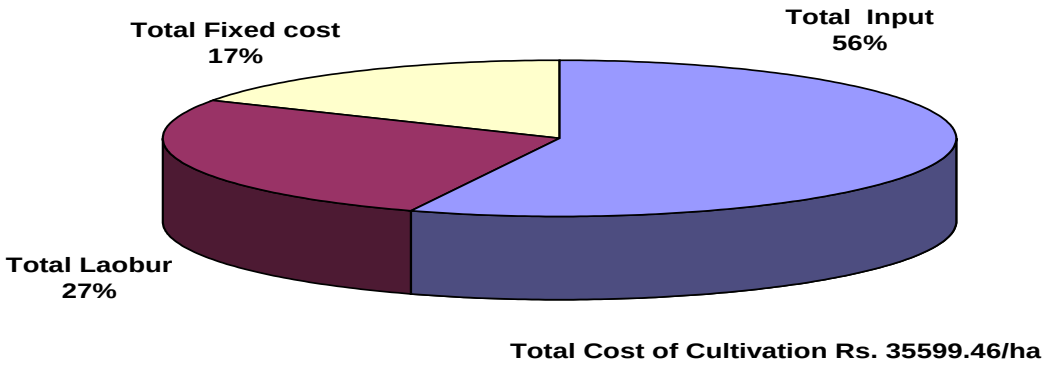

Fig. 3.8 : Cost of Cultivation of Cultivation of Lemongrassl

3.2.2.3 Returns from Lemongrass

Average Lemongrass growers received Rs.27540 per hectare returns from extraction of oil after processing the raw lemon grass leaves. As regard the net return over total cost, it was found to be negative (Rs.-8059.46/ ha.). The net return over the total variable cost was also found negative (Rs.-2056.46/ha). The cost of production/ liter was found Rs.332.40 over variable cost, while it was Rs.387.79 over total cost. It means the Lemongrass grower of the area under study are not receiving sufficient profit from their produce of the lemon grass, as the one liter price of the produce was less in the area under study. The data also reveals that an average Lemongrass grower receiving only Rs 0.93 on total variable cost, while he received only Rs.0.77 over total cost of cultivation on investment of Rs. 1.00. (Table 3.18)

Table 3.18: Returns from Cultivation of Lemon grass (ha)

S. No.	Particulars	Quantity		Value	
		Per ha	Per farm	Per ha	Per farm
1	Yield of main product	91.8	36.72		
2	Price per liter	300		27540	11016.00
3	Yield of byproduct				
4	Price per kg				
5	Gross return			27540	11016.00
6	Total variable cost of cultivation			29596.46	11838.58
7	Total cost of cultivation			35599.46	14239.78
8	Net Return:				
a)	Over variable cost			-2056.46	-822.58
b)	Over total cost			-8059.46	-3223.78
9	Cost of Production /liter				
a)	Over variable cost			322.40	
b)	Over total cost			387.79	
10	Return per Rupee				
a)	Over variable cost			0.93	
b)	Over total cost			0.77	

3.2.3 Competing Crop of Lemongrass- Paddy- Wheat

Lemongrass is the perennial crop, which is suitable for the development of waste land and the recommendation of this particular crop is only for the degraded land which is not use for cultivation purposes. Lemon grass has an ability to develop these degraded

lands into cultivable land in due course of time (approximate 5 years).But due to lack of technical know-how, the cultivators of the study area shifted their traditional crop rotation (paddy - wheat) in to lemongrass crop cultivation. Hence, this crop rotation i. e. paddy followed by wheat is taken into consideration, while comparing this particular crop (Lemongrass). The economics of related to paddy and wheat crop individually is given in Appendix 1.4. As the data of cost of cultivation of paddy and wheat were collected from the same respondents hence, their general information of paddy-wheat growers is same as of lemongrass growers.

3.2.3.1 General Features of Paddy –Wheat cropping Sequence:

The Paddy –Wheat cropping sequence is the main cropping sequence in the area of the state where average rainfall is above 1200mm. The general feature of wheat is already discussed. Hence, in this subhead the general feature of paddy is dealt in detail.

Among the food crops, paddy *(Oryza Sativa (L)*occupies an extremely important position. It constitutes the main source of food throughout Asia and other parts of the world. Paddy is the only grain crop which can be grown under a wide range of edaphic and environmental conditions, such as monsoonal conditions prevalent in the major areas of tropical Asia and elsewhere. Frequent flooding is a normal feature in these areas. In India, paddy occupies the first position among the cereals in respect of both area and production. In 2001, paddy was grown on about 152 million ha. in the entire world.

The productivity of paddy in different states of India is lower as compared to India (Table 3.19). Factors like drought lodging, weeds, soils acidity/ sodicity, poor soil fertility, insect pest diseases, rodents etc. are responsible for low yields and the yield loss varies from ecosystem to ecosystem.

In north- eastern as well as peninsular parts of India paddy is grown through out the year, subject to the availability of the required volume of water through rainfall and/ or irrigation. It has been observed that generally a single rainfed paddy crop can be produced if the rainfall varies between 1000 and 1500 millimeters. This quantum of rainfall should be distributed over a period of 90 to 110 days. If requires 20 – 34^{o}C temperature. A seed rate used 30-60 kg./hectare, nursery plant transplanted after 21 days of sowing up to 2nd & 3rd week of July. Among the total Area and Production of India, Madhya Pradesh is contributed 4.0 per cent area and 2.0 per cent of production.

Table 3.19 : Area, Production and Yield of Paddy of major Paddy producing states. (2003)

States	Area (Million ha.)	Production (Million tonnes)	Yield (Kg. / hectares)
West Bengal	5.84	14.39	2463
Punjab	2.53	8.88	3510
Uttar Pradesh	4.42	8.11	1836
Andhra Pradesh	2.75	7.19	2621
Tamil Nadu	1.70	5.71	3350
Bihar	3.59	4.98	1386
Assam	2.54	3.74	1471
Orissa	4.27	3.24	759
Chattisgarh	3.64	2.55	702
Haryana	0.91	2.47	2724
Karnataka	1.15	2.24	1938
Jharkhand	1.52	2.17	1430
Maharashtra	1.52	1.85	1213
Madhya Pradesh	1.45	0.90	620
Kerala	0.31	0.70	2230
Gujarat	0.48	0.60	1241
Others	1.66	2.93	--
All India	40.28	72.65	1804

Source : Agricultural Statistics at a glance August 2004

Paddy is grown particularly in the Chattisgarh Plains and the Northern Hill Region of Chattisgarh agro climatic regions of M.P. The Balaghat, Shahdol, Mandla, Sidhi, Rewa, Satna, Panna, Jabalpur, and Seoni are the major paddy growing districts of the state.

The hull constitutes approximately 20-25 per cent of the total rice weight. The average composition of the husked and milled rice is presented below.

Table3.20. : Constituents of Rice

Constituents (percent)	Husked	Milling
Carbohydrates	72.2	79.4
Fat	2.0	0.3
Proteins	8.9	7.6
Ash	1.9	0.4
Vitamins (PPM)		
Thiamine (B1)	3.5	0.6 – 1.0
Riboflavin (B2)	0.8 – 1.0	0.28
Nicotinic acid (Niacin)	55.0	15-20
Pantothenic acid	17.0	6.4
Minerals (Percent)		
Calcium	0.084	0.009
Phosphorus	0.290	0.096
Iron	0.002	0.001

Rice is mostly consumed as cooked whole grains. Milling technology is therefore geared to obtain maximum out turn of milled rice reducing the breakage to the minimum. The most commonly used machine is a rice huller, which combines de-husking and polishing in one operation, but the whole rice recovery is below 65% and rice breakage is very high (30 – 40 per cent). For further improving the milling and nutritive value of rice, it is parboiled before milling. This process involves soaking in water steaming & drying. Rice when milled usually yields apart from white rice 21- 24 per cent, husk 3- 7 per cent and 0.2 – 2 per cent broken and germs.

Rice by and large is consumed as a whole grain. It is also used for brewing in many regions. However Rice is ground into flour to manufacture products viz. snack foods like rice cake, noodles, cookies as well as baby food. In general flour made from waxy rice is better in quality for use as a thickening agent to make white sauces, puddings, and gravies. The most widespread use of rice hull littering or bedding which has been practiced since ages. Hulls are also used as boiler fuel. These are particularly useful for bedding of poultry pans/ sheds. Rice hull ash used as oil absorbent and provides an anti solid surface. Water proof (resistant) composite building boards can be successfully made from the rice hull.

Paddy bran is source of protein, oil and nutrients. It is mainly used as a animal feed but its use is limited owing to a high oil content along with a high level of fatty acids. Its oil content varies from 5- 20 percent. High quality edible oil is extracted from fresh raw paddy bran. Paddy bran oil is highly rich is nutrients like vitamin E. It is helpful in lowering the cholesterol level in the blood. It is used for cooking and frying after necessary processing crude paddy bran oils which have a high acid value are generally used to produce solidified oil. stearic and acids glycerin and soap. Rice wax is useful for industrial, cosmetic and edible purposes after it has been perfectly processed. Paddy straw does not make a good fodder is yet fed to the animals is used as bedding material in animal sheds. Paddy straw is also used as a packing material mainly as a filter for various finished goods, fruits and vegetables. It can be used as a mulching material for soil and water conservation.

3.2.3.1Cost of Cultivation:

The cost of cultivation related paddy-wheat crop rotation is given under this sub head, which includes operational cost, total cost and returns per ha and per farm in the area under study.

3.2.3.1.1 Operational Cost:

As per the data given in table 3.21, it is clear that an average grower employed more women labours (118 days) followed by men (65.7 days) and machine (36.55hours) in cultivation of paddy- wheat crops. Among the 118 women days which were utilized in cultivation the maximum were engaged in harvesting (52.3 days) followed by transplanting (38 days), weeding (18.1 days), processing (7.6 days) and packing (2 days). As regard to men days the maximum were used in irrigation(17.8 days followed by harvesting (9.5 days), processing (8.6 days), transportation (5.5 days), weeding (4.5 days), chemical fertilizer (4.3 days), marketing (4 days), land preparation, FYM & transplanting (2. 2 days/ha.) .

Table 3.21: Details of labour Employed in Cultivation of Paddy Wheat Growers (ha)

S. No.	Operation Wise Labour	Per hactare				Per Farm			
		M	W	Bp	Mp	M	W	Bp	Mp
1	Land Preparation	2.00	0.00	0.00	9.10	8.54	0.00	0.00	38.86
2	Fym/ Compost-Transportation and Application	2.00	0.00	0.00	2.00	8.48	0.00	0.00	8.48
3	Transplanting	4.00	38.00	0.00	5.95	17.02	161.18	0.00	25.40
4	Chemical fertilizer	4.30	0.00	0.00	0.00	18.35	0.00	0.00	0.00
5	Weeding -manual	4.50	18.10	0.00	0.00	19.20	76.74	0.00	0.00
6	irrigation	17.80	0.00	0.00	0.00	76.22	0.00	0.00	0.00
7	Harvesting	9.50	52.30	0.00	0.00	40.61	222.77	0.00	0.00
8	Processing	8.60	7.60	0.00	15.50	36.76	32.34	0.00	66.38
9	Packing	3.50	2.00	0.00	0.00	14.90	8.54	0.00	0.00
10	Transportation	5.50	0.00	0.00	2.00	23.50	0.00	0.00	8.54
11	Marketing	4.00	0.00	0.00	2.00	17.08	0.00	0.00	8.54
	Total	65.70	118.00	0.00	36.55	280.67	501.58	0.00	156.20

As regards to the machine power which was used in cultivation of paddy-wheat cropping system it is found that only 36.55 hours used in the study area. Amongst the total number of machine power hours was found the maximum were used in processing

(15.5 hours) followed by land preparation (9.1hours), Transplanting (5.96 hours) and transportation as well as marketing and FYM application per ha in the study area.

3.2.3.2 Total Cost

The total cost of cultivation of paddy- wheat cropping system per hectare of an average farmer is presented in table 3.22. The total cost includes both variable as well as fixed cost. It is observed from the data that total cost Rs.33,738.59/ha occurred in cultivation of paddy-wheat during a year in which variable cost was Rs.26,326.54/ ha (78.03%) and fixed cost Rs.7412.06/ha (21.97%). Amongst the total variable cost it was found that 60.40 per cent cost spent on labour and 39.60 per cent cost spent on input by average sample farmer. It shows that the prevailing paddy-wheat cropping system was labour intensive rather than capital intensive. Amongst the total labour cost the maximum used in machine labour (31.24%) followed by women labour (17.93 per cent) and men labour (11.23 per cent) used in their field for the cultivation of paddy-wheat crops. Amongst the input cost it was found that the maximum cost was spent on irrigation (13.24 per cent) followed by fertilizer (9.74 per cent), seed (9.30 per cent), packing (3.18 per cent) and FYM (1 per cent).

3.2.3.3 Returns from Paddy-Wheat cropping System:

The returns obtained by an average cultivator are presented in table 3.22. It is depicted from the data that an average farmer received Rs. 17,085.22/ hectare as a net return over variable cost and Rs.9,673.17/ ha over total cost. The cost of production of producing a quintal of paddy and wheat was found to be Rs.436.74/ quintal over variable cost and Rs.559.70/ quintal over total cost in the area under study. As regards returns from per rupees investment an average farmer got Rs.1.65 over variable cost and Rs.1.29 over total cost in paddy- wheat cropping system in the study area.

Table 3.22: Cost and Returns from Cultivation of Paddy -wheat

S. No	Particulars	Per ha	Per farm	Percentage to Total	Percentage to TVC/FC
A	VARIABLE COST				
1	Seed	2447.60	20902.50	7.25	9.30
2	Fym (tractor trolley)	264.30	2257.12	0.78	1.00
3	Chemical fertilizer	0.00	0	0.00	
a)	Urea	873.73	7461.67	2.59	3.32
b)	DAP	1515.03	12938.34	4.49	5.75
d)	MOP	175.59	1499.59	0.52	0.67
4	Labour				
a)	Men	2956.50	25248.51	8.76	11.23
b)	Women	4720.00	40308.8	13.99	17.93
c)	Bullock Power	0.00	0	0.00	0.00
d)	Machine Power	8223.75	70230.83	24.37	31.24
	Total Labour	15900.25	135788.10	47.13	
5	Amortized cost of irrigation	3486.25	29772.58	10.33	13.24
6	Packing material, packing ,loading, transportation	837.80	7154.81	2.48	3.18
7	Interest on working capital	825.99	7053.96	2.45	3.14
8	Total Variable Cost	26326.54	224828.60	78.03	100
B	FIXED COST				
9	Rental value of land	7907.62	67531.07	23.44	106.69
10	Depreciation	822.38	7023.08	2.44	11.10
11	Total Fixed cost	7412.06	63298.95	21.97	100.00
c	TOTAL COST OF CULTIVATION	33738.59	288127.60	100.00	
D	RETURNS				
12	Gross return	43411.76	370736.40		
13	Net Return:				
	Over variable cost	17085.22	145907.80		
	Over total cost	9673.17	82608.84		
14	Per Rupee Return				
	Over variable cost	1.65			
	Over total cost	1.29			
15	Cost of Production				
	Over variable cost	436.74			
	Over total cost	559.70			

3.2.3.4 Lemon grass Vs Paddy-Wheat cropping System:

The comparative economics of lemongrass over paddy-wheat cropping system per ha and per farm have been worked out and presented in table 3.23. It is depicted from the data that lemongrass is not a profitable combination when we compared it with paddy-wheat cropping system. An average farmer received 930.81 per cent less net return over variable cost from paddy-wheat cropping sequences as compared to lemongrass. He also got 220.02 percent less over total cost of cultivation as compared to paddy-wheat cropping system.

Table 3.23: Comparative Cost & Returns of Lemon grass and Paddy -Wheat (Rs/ha)

S. No.	Particulars	Lemon grass	Paddy-Wheat	Percentage Difference over Lemon grass
	COST			
1	Total Input	1994146	10426.29	99.48
2	Total Labour	9655.00	15900.25	-64.68
3	Total Variable Cost	29596.46	26326.54	11.05
4	Total Fixed cost	6003.00	7412.06	-23.47
5	TOTAL COST OF CULTIVATION	35599.46	33738.60	5.23
	RETURN			
1	Gross return	27540.00	43411.76	-57.63
2	Net Return:			
a)	Over variable cost	-2056.46	17085.22	930.81
b)	Over total cost	-8059.46	9673.16	220.02
4	Return per Rupee			
a)	Over variable cost	0.93	1.65	-77.32
b)	Over total cost	0.77	1.29	-67.53

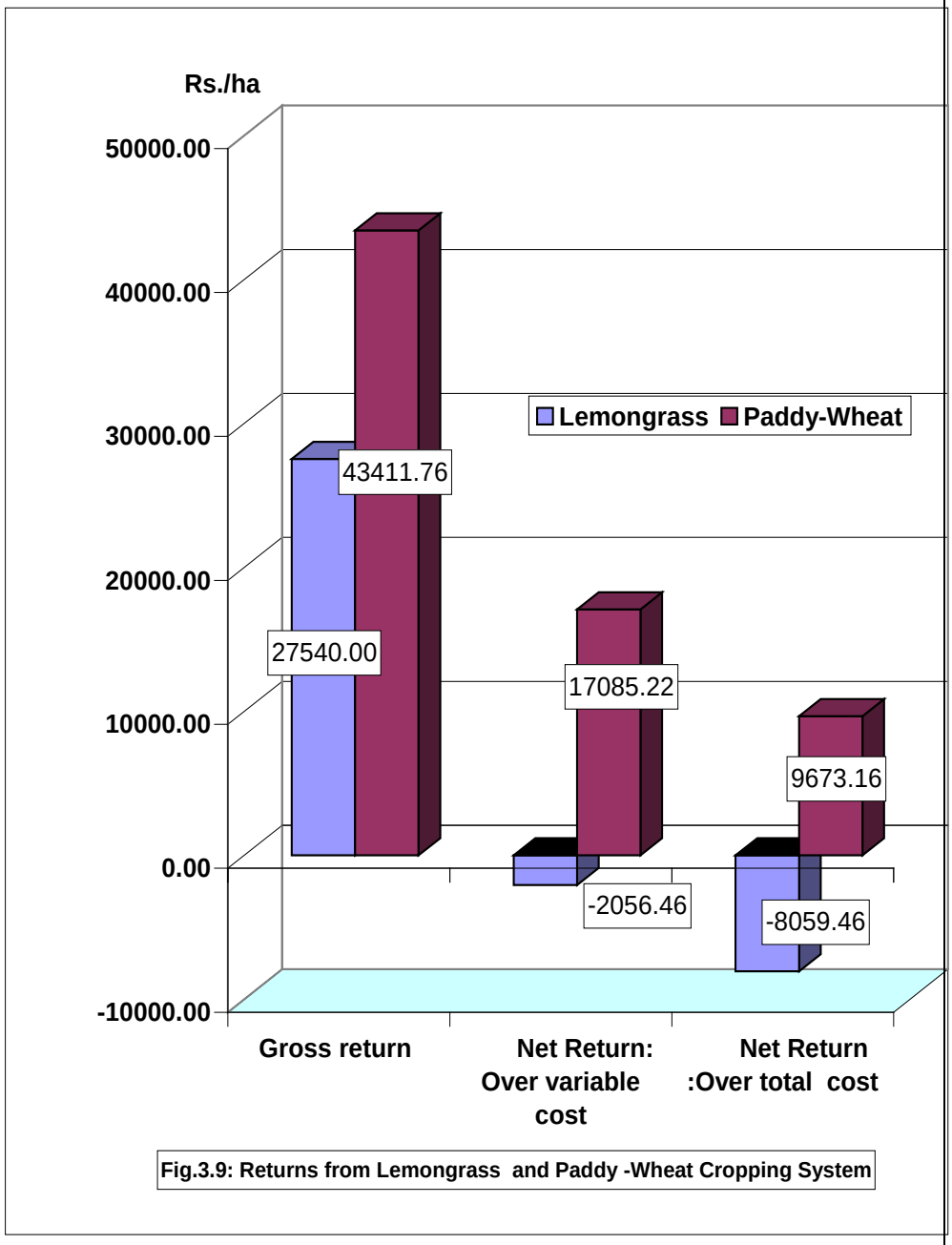

Fig.3.9: Returns from Lemongrass and Paddy -Wheat Cropping System

The cultivation of lemon grass is capital intensive rather than labour intensive. The cultivation of lemongrass provided less employment (-64.68%) as compared to paddy- wheat cropping system, while it need more input (99.48%) as compared to paddy -wheat cropping system. The cultivation of lemongrass needs more cost (5.23%) as compared to paddy -wheat cropping system. Due to all these reasons the cultivators of the study area shifted their lemon grass area to other crops (Colius).

Hence, the growing of lemongrass is proved to be a means of diversification due to the fact that after growing lemongrass the cultivators rather than came back to their traditional cropping system i.e. paddy-wheat, they shifted their lemongrass area to a more remunerative medicinal crop i.e. colius in the area under study.

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CHAPTER IV

MOTIVATING FACTORS AND PROCESS OF DECISION –MAKING

The motivational factors and decision- making of medicinal (Isabgol) as well as aromatic (lemon grass) crop growers are presented in this chapter, which is purely based on the collected primary data from the selected cultivators in the area under study. The chapter also includes the problem faced by the growers in marketing of produce of these crops. This chapter divided into two parts as per the selection of the crops for the study i.e. a) Medicinal crop: Isabgol and b) Aromatic crop: Lemon grass.

4.1 Medicinal crop: Isabgol:

Isabgol growers of the area faced many problems in the marketing of produce

4.1.1 Motivating Factors:

The Isabgol growers of the area under study sold their produce from three channels i.e. i) through village merchant (commission agent), ii) through wholesale dealer (Regulated Market) and iii) to processor at Unjha (Gujarat). The 50 per cent of Isabgol growers sold their produce to village merchant, while 32 per cent and 18 per cent sold their produce respectively through wholesale dealer and to processor.

The motivating factors which influence the cultivators' decisions for taking medicinal crops (Isabgol) are presented in Table 4.1. It is clear from the data that low cost of cultivation and more remunerative price of the product, market nearness and has good demand of the product were the major motivating factors in cultivation of Isabgol instead of wheat.

Table 4.1: Motivating factors for taking Cultivation of Isabgol

S. No.	Particulars	Numbers	Per-centage
1	Easy available of inputs and easy to grow	25	50
2	Market nearness	45	90
3	Good price	43	86
4	Low cost of cultivation	48	96
5	Others farmers in the village are growing	23	46
6	Has good demand	49	98
	Total	50	100

These reasons were reported by more than 85 per cent of cultivators in the area under study. Other factors which, influenced the farmers' decisions and reported by the 50 and 46 per cent of cultivators were easy availability of input and easy to grow by the cultivators, and others farmers in the village are growing.

4.1.2 Factors that Provoke farmers to shift area under Wheat to Isabgol:

Factors that provoke farmers to shift area under wheat to Isabgol are presented in table 4.2. It is depicted from the data that the major factors that provoke them are the higher price of Isabgol than wheat (80% and 20 %), less problem in marketing (20 % and 80%), less market margin and more profit in growing Isabgol than Wheat as reported by the majority of cultivators and put them at 1st and 2nd ranked. The factors which are of least importance and cultivators put them at 6th and 7th ranked are it is tedious to grow wheat, inadequate knowledge and unfavorable weather condition to grow wheat in the area under study.

Table 4.2: Factors that Provoke farmers to shift area under Wheat to Isabgol

S.NO.	Particulars	Rank given by the Respondents													
		1		2		3		4		5		6		7	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Price of the Isabgol is higher than Wheat	40	80	10	20	0	0	0	0	0	0	0	0	0	0
2	Large market margin and less profit	30	60	5	10	3	6	2	4	4	8	6	12	0	0
3	No Problem of pest and diseases on the crop	0	0	0	0	0	0	0	0	0	0	24	48	26	52
4	Problem in marketing	0	0	0	0	0	0	0	0	0	0	10	20	40	80
5	Price Fluctuations	2	4	4	0	4	8	3	6	24	48	10	20	3	6
6	It is tedious to grow the medicinal crop	0	0	0	0	0	0	0	0	0	0	14	28	36	72
7	Inadequate Knowledge	0	0	0	0	2	4	0	0	0	0	25	50	24	48
8	Unfavorable weather conditions at the time of harvesting	0	0	0	0	0	0	0	0	0	0	32	64	18	36

4.1.3 Marketing Problems:

There are so many problems existed in the marketing of medicinal crops as reported by numbers of research workers. But Isabgol is an exception to these medicinal crops. As the majority of Isabgol growers frankly reported that they have not any problem as related to marketing of Isabgol in the area under study. The 48 per cent of them reported this fact at 1st rank while others (52%) ranked it at 2nd position. Thus, there is no specific problem related to Isabgol is found in the area under study. All the general problems which were faced by Isabgol growers are the higher commission of village merchant, delay in payment, irrational deductions as reported by 40 per cent, 46 per cent , and 46 per cent respectively cultivators and put this problems at 1st and 2nd rank, while others were reported them at 3rd to 7th rank . (Table 4.3)The others problems which are of less importance and more than 40 per cent Isabgol growers put them at 7th position are quote lower price than actual prevailing price (54%), Whole sellers not taking consent while selling (68%), harassment by middlemen (56%) and distant market (46%)

Table 4.3: Marketing Problems Faced by the Farmers in growing Isabgol

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quote lower price than actual prevailing price	0	0	0	0	0	0	0	0	0	0	23	46	27	54
Higher Commission	20	40	15	30	4	8	4	8	7	14	0	0	0	0
Whole sellers not taking consent while selling	0	0	0	0	0	0	0	0	6	12	10	20	34	68
Delay in payment	23	46	15	30	10	20	2	4	0	0	0	0	0	0
Irrational deductions	23	46	15	30	4	8	3	6	2	4	2	4	1	2
harassment by middlemen	0	0	0	0	0	0	0	0	1	2	21	42	28	56
Distant market	8	16	2	4	1	2	2	4	3	6	11	22	23	46
No Problem	0	0	0	0	0	0	0	0	0	0	24	48	26	52

4.1.4 Factors determining farmers' decisions to bring more area under Isabgol Crop Cultivation:

Easy market channel, price of Isabgol is higher are found the main factors, which determining the farmers' decision to bring more area under Isabgol. These factors were reported respectively by 86 and 96 percent respondents and ranked it at 1st position. None of the farmers reported that they were got incentive from government and use for herbal medicine in my village. (Table 4.4)

Table 4. 4: Factors determining farmers' decisions to bring more area under Isabgol Crop Cultivation (Numbers)

S.NO.	Particulars	Rank given by the Respondents											
		1		2		3		4		5		6	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Easy Market Channel	43	86	7	14	0	0	0	0	0	0	0	0
2	Government Scheme	0	0	0	0	0	0	0	0	0	0	0	0
3	Price of Isabgol is higher	48	96	2	4	0	0	0	0	0	0	0	0
4	No problem of pest and diseases	37	74	13	26	0	0	0	0	0	0	0	0
5	Drought tolerance crop	12	24	11	22	8	16	7	14	6	12	4	8
6	Use for herbal medicine in my village	0	0	0	0	0	0	0	0	0	0	0	0

4.1.5 Factors that Provoke farmers to shift area under Isabgol to Cumin:

As discussed earlier that there is risk in cultivation of Isabgol crop in the area under study. But, there is no doubt that the cultivation of medicinal crops are the means of diversification as after growing the medicinal crops like Isabgol cultivators not went to their traditional crops (wheat). As the 80 per cent (1st rank) of the Isabgol growers reported that they were gone to more remunerative crop like Cumin as the price of the other crop is higher than medicinal crop. The most of Isabgol growers were shifted their Isabgol area to Cumin, which is

one of the more remunerative crops of the area under study. In the same cost of cultivation and same productivity levels cultivators got more remuneration as the price of Cumin is approximately Rs.7000/- per quintal.

Table 4.5: Factors that Provoke farmers, to shift area under Isabgol to Cumin

(Numbers)

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Price of the other crop is higher than medicinal crop	40	80	10	20	0	0	0	0	0	0	0	0	0	0
Large market margin and less profit	30	60	5	10	3	6	2	4	4	8	6	12	0	0
No Problem of pest and diseases on the crop	0	0	0	0	0	0	0	0	0	0	24	48	26	52
Problem in marketing	0	0	0	0	0	0	0	0	0	0	10	20	40	80
Price Fluctuations	24	48	10	20	4	8	3	6	2	4	4	0	3	6
It is tedious to grow the medicinal crop	0	0	0	0	0	0	0	0	0	0	14	28	36	72
Inadequate Knowledge	25	50	24	48	2	4	0	0	0	0	0	0	0	0
Unfavorable weather conditions at the time of harvesting	32	64	18	36	0	0	0	0	0	0	0	0	0	0

The other factors that provoked by them and more than 40 per cent of Isabgol growers put it at 1st rank are price fluctuation, and inadequate knowledge. The factors that of less importance and Isabgol growers put them at 7th ranked are no problem of pest and diseases on the crop, problem in marketing, and it is tedious to grow the medicinal crop as reported by 72, 80, and 52 per cent of Isabgol growers in the study area.

4.1.6 Factors those Determining farmers' decisions to bring area under Wheat:

The cultivators' still not compromised with Isabgol cultivation with the wheat as it is consumed at his home (100%) , having easy market channels(60%), government schemes (80%) i.e. support price , crop insurance, crop loan etc. , more tolerance to rains as compared to Isabgol (72%) ,

less price fluctuation than Isabgol(52%) more knowledge of cultivation (52%) and unfavorable weather conditions at the time of harvesting (64%) .

Table 4. 6: Factors determining farmers' decisions to bring more area under wheat than Isabgol

(Numbers)

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Easy Market Channel	30	60	20	40	0	0	0	0	0	0	0	0	0	0
Government Scheme	40	80	10	20	0	0	0	0	0	0	0	0	0	0
No Problem of pest and diseases	0	0	0	0	0	0	0	0	0	0	24	48	26	52
Tolerant to rains	36	72	14	28	0	0	0	0	0	0	0	0	0	0
Price Fluctuations	26	52	8	16	4	8	3	6	2	4	4	0	3	6
It is tedious to grow the medicinal crop	0	0	0	0	0	0	0	0	0	0	14	28	36	72
Adequate Knowledge	26	52	23	46	1	2	0	0	0	0	0	0	0	0
Home Consumption	50	100	0	0	0	0	0	0	0	0	0	0	0	0

More than 50 per cent of cultivators of the area under study reported all these factors and put by them at 1st ranked. (Table 4.6). The others factors which were of less importance and put by the cultivators at 7th ranked are it is tedious to grow the medicinal crop and no problem of pest and diseases as reported by 72 and 52 per cent of cultivators respectively.

4.2 Aromatic crop: Lemongrass:

The cultivators of the study area are facing so many problems in the marketing of lemon grass produce (oil).

4.2.1 Motivating Factors:

The motivating factors are entirely different from those of given for the medicinal crop of the study. The real fact is that, in the study area, the traders were convinced the cultivators that if they produce lemon grass in their field, they become millionaires in a short span of time. In this way, the traders sold their planting material of lemongrass to the innocent farmers at high price and were benefited. After that, the traders shifted their area of cultivation to another remunerative crop or in another business. Although, in some extent the motivational factors for taking lemongrass cultivation in the area under study were, easy available of inputs and easy to grow, and has good demand as reported by 42 and 28 per cent of respondents in the area under study. (Table 4.7)

Table 4.7: Motivating factors for taking Cultivation of Lemongrass

S. No.	Particulars	No.	Percentage
1	Easy available of inputs and easy to grow	21	42
2	Market nearness	6	12
3	Good price	4	8
4	Low cost of cultivation	2	4
5	Others farmers in the village are growing	3	6
6	Has good demand	14	28
	Total	50	100

4.2.2 Factors that Provoke farmers to shift area under Paddy –Wheat to Lemongrass:

The factors that provoke farmers to shift area under paddy - wheat to lemongrass are presented in table 4.8. It is depicted from the data that price of lemongrass is higher than paddy-wheat, large market margin and less profit were the main factors ,which provoke farmers to shift area under paddy –wheat crops to lemon grass as reported by 58 and 20 percent, and 52 and 18 percent farmers and ranked it at respectively at 1st and 2nd position. Others factors i.e. problem

of pest and diseases on the crop, problem in marketing, price fluctuations, and Inadequate Knowledge which were reported by the cultivators are of least importance and farmers were ranked them at 6^{th} and 7^{th} position in the area under study.

Table 4.8: Factors that Provoke farmers to shift area under Paddy-Wheat to Lemongrass

S.NO.	Particulars	Rank given by the Respondents													
		1		2		3		4		5		6		7	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Price of the Lemongrass is higher than Paddy & Wheat	29	58	10	20	5	10	3	6	2	4	1	2	0	0
2	Large market margin and less profit	26	52	9	18	6	12	4	8	3	6	1	2	1	2
3	Problem of pest and diseases on the crop	0	0	0	0	0	0	3	6	8	16	17	34	22	44
4	Problem in marketing	0	0	0	0	2	4	5	10	7	14	11	22	25	50
5	Price Fluctuations	0	0	0	0	0	0	0	0	0	0	25	50	25	50
6	It is tedious to grow the Aromatic crop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Inadequate Knowledge	0	0	3	6	7	14	5	10	12	24	10	20	13	26

4.2.3 Marketing Problems:

The marketing problems reported by sample respondents of the study area are presented in table 4.9. It is depicted from the data that the major problems in the marketing of lemongrass were, quote lower price than actual prevailing price, higher commission and whole sellers not taking consent while selling as reported by cent per cent of cultivators and ranked them at first position. The other problems which were reported respectively by 46, 46, 46 and 42 per cent of lemongrass growers and put these on first and second ranked were delay in payment, irrational deductions, distant market and harassment by middlemen.

Table 4.9: Marketing Problems Faced by the Farmers in growing Lemongrass

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quote lower price than actual prevailing price	50	100	0	0	0	0	0	0	0	0	0	0	0	0
Higher Commission	50	100	0	0	0	0	0	0	0	0	0	0	0	0
Whole sellers not taking consent while selling	50	100	0	0	0	0	0	0	0	0	0	0	0	0
Delay in payment	23	46	15	30	10	20	2	4	0	0	0	0	0	0
Irrational deductions	23	46	15	30	4	8	3	6	2	4	2	4	1	2
harassment by middlemen	21	42	28	56	0	0	0	0	0	0	0	0	0	0
Distant market	23	46	11	22	1	2	2	4	3	6	10	20	0	0
No Problem	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4.2.4 Factors those Determining farmers' decisions to bring area under Lemongrass:

The main factors those determining farmers' decisions to bring area under Lemongrass were no problem of pest and diseases and drought tolerance crop as reported by 74 per cent and 16 per cent ,and 62 per cent and 14 per cent respectively at first and second ranked by the cultivators in the area under study. The other factors that pointed out by the lemongrass growers were easy market channel, price of lemongrass is higher than traditional crop reported by the cultivators but put them at 5^{th} and 6^{th} ranked. (Table4.10)

Table 4.10: Factors determining farmers' decisions to bring more area under Lemongrass crop cultivation

(Numbers)

S.NO.	Particulars	Rank given by the Respondents											
		1		2		3		4		5		6	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Easy Market Channel	3	6	5	10	7	14	8	16	14	28	17	34
2	Government Scheme	0	0	0	0	0	0	0	0	0	0	0	0
3	Price of Aromatic crops is higher	4	8	5	10	8	16	9	18	11	22	13	26
4	No problem of pest and diseases	37	74	8	16	5	10	0	0	0	0	0	0
5	Drought tolerance crop	31	62	7	14	4	8	3	6	3	6	2	0
6	Use for herbal medicine in my village	0	0	0	0	0	0	0	0	0	0	0	0

4.2.5 Factors that Provoke farmers to shift area under Lemongrass to Colius:

As from earlier discussion, it was found that the price of lemon grass oil was found low in the area under study. Therefore, the cultivators shifted their area from lemongrass to a more remunerative crop i.e. Colius. The factors that provoke farmers to shift area under Lemongrass to Colius given in table 4.11. The table reveals that price of Colius is higher than lemongrass, was the main factor that provokes farmers to shift their area to Colius as reported by 82 per cent of cultivators and ranked it at first position in the area under study. The factors which were of least importance and were reported by cultivators at 6^{th} and 7^{th} rank are large market margin and less profit problem of pest and diseases on the crop problem in marketing price fluctuations it is tedious to grow the aromatic crop and inadequate knowledge.

Table 4.11: Factors that Provoke farmers, to shift area under Lemongrass to Colius

(Numbers)

S.No.	Particulars	1		2		3		4		5		6		7	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Price of Colius is higher than lemongrass	41	82	9	18	0	0	0	0	0	0	0	0	0	0
2	Large market margin and less profit	0	0	5	10	3	6	2	4	12	24	18	36	10	20
3	Problem of pest and diseases on the crop	0	0	0	0	0	0	0	0	0	0	24	48	26	52
4	Problem in marketing	0	0	0	0	0	0	0	0	0	0	40	80	10	20
5	Price Fluctuations	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	It is tedious to grow the Aromatic crop	0	0	0	0	0	0	0	0	0	0	14	28	36	72
7	Inadequate Knowledge	0	0	0	0	0	0	0	0	2	4	25	50	24	48

4.2.6 Factors those Determining farmers' decisions to bring area under Paddy-Wheat than Lemongrass:

The main factors those determining farmers' decisions to bring more area under paddy –wheat than lemongrass were home consumption, easy market channel, government scheme, and tolerance to rains. The majority of cultivators were reported these factors at first and second ranked in the area under study.

Table 4.12: Factors determining farmers' decisions to bring more area under Paddy – Wheat than Lemongrass crop cultivation

(Numbers)

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Easy Market Channel	26	52	14	28	5	10	5	10	0	0	0	0	0	0
Government Scheme	27	52	23	46	0	0	0	0	0	0	0	0	0	0
No Problem of pest and diseases	0	0	0	0	0	0	6	12	11	22	13	26	20	40
Tolerant to rains	21	42	11	22	7	14	5	10	3	6	2	4	1	2
Price Fluctuations	0	0	2	4	4	8	6	12	8	16	12	24	18	36
It is tedious to grow the aromatic crop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adequate Knowledge	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Home Consumption	50	100	0	0	0	0	0	0	0	0	0	0	0	0

The other factors that pointed out by the lemongrass growers were tolerant to rains, no problem of pest and diseases and price fluctuations reported by the cultivators but put them at 6^{th} and 7^{th} ranked. (Table 4.12)

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CHAPTER V

PROBLEMS IN MARKETING

The problems faced by the respondents in marketing of competing crops i.e. wheat and paddy-wheat respectively of selected medicinal (Isabgol) and aromatic (Lemongrass) are presented in this chapter

5.1 Market problems in Wheat:

Market problems that faced by the farmers in marketed wheat are listed in table 5.1. It is depicted from the data that there were no specific problem related to wheat crop is reported by the sample respondents in the area under study. All are the general problems of marketing as reported by them such as higher Commission, delay in payment, irrational deductions, harassment by middlemen and distant market as reported by the majority of the cultivators in the area under study. The problems which were of lesser importance and cultivators put them at 6^{th} and 7^{th} ranked are whole sellers not taking consent while selling and quote lower price than actual prevailing price .

Table 5.1: Marketing Problems Faced by the Farmers in growing Wheat

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quote lower price than actual prevailing price	0	0	0	0	0	0	0	0	0	0	23	46	27	54
Higher Commission	20	40	15	30	4	8	4	8	7	14	0	0	0	0
Whole sellers not taking consent while selling	0	0	0	0	0	0	0	0	6	12	10	20	34	68
Delay in payment	23	46	15	30	10	20	2	4	0	0	0	0	0	0
Irrational deductions	23	46	15	30	4	8	3	6	2	4	2	4	1	2
Harassment by middlemen	21	42	28	56	0	0	0	0	1	2	0	0	0	0
Distant market	8	16	2	4	1	2	2	4	3	6	11	22	23	46
No Problem	0	0	0	0	0	0	0	0	0	0	24	48	26	52

5.2 Market problems in Paddy-Wheat:

Market problems that faced by the farmers in marketed paddy -wheat are listed in table 5.2. It is depicted from the data that whole sellers not taking consent while selling, delay in payment, irrational deductions, harassment by middlemen and distant market were the major problem in marketing of produce of wheat and paddy as reported by majority of respondents and put them at 1st and 2nd ranked in the area under study. The others problems which are of less importance and reported by the cultivators at 6th and 7th ranked were quote lower price than actual prevailing price and higher Commission. (Table 5.2)

Table 5.2: Marketing Problems Faced by the Farmers in growing paddy –wheat

Particulars	Rank given by the Respondents													
	1		2		3		4		5		6		7	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Quote lower price than actual prevailing price	2	4	3	6	5	10	7	14	9	18	10	20	14	28
Higher Commission	3	6	4	8	7	14	8	16	9	18	9	18	10	20
Whole sellers not taking consent while selling	33	66	12	24	5	10	0	0	0	0	0	0	0	0
Delay in payment	35	70	11	22	4	8	0	0	0	0	0	0	0	0
Irrational deductions	14	28	11	22	10	20	8	16	5	10	2	4	0	0
Harassment by middlemen	11	22	11	22	10	20	8	16	4	8	3	6	3	6
Distant market	10	20	12	24	11	22	7	14	4	8	3	6	3	6
No Problem	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5.3Contractual Agreements:

The facilities of contractual agreements are not prevailing in the area under study. Although, some of the traders created interest for cultivation of medicinal and aromatic crops between the farmers and exploited them that they given the by back guaranty. But none of the farmer reported that they got the remunerative price from them

5.4 Constraints faced by firms:

The cultivation of medicinal (Isabgol) and aromatic (lemongrass) crops is not found in practices by the firms in the area under study. Hence, the data related to constraints faced by firms in cultivation are not available for these crops.