A STUDY ON PRODUCTION AND MARKETING OF MENTHA IN LAKHIMPUR KHERI DISTRICT OF UTTAR PRADESH

काशी हिन्दू विश्वविद्यालय

BANARAS HINDU UNIVERSITY

Project Report

Submitted in partial fulfilment of the requirements
for the degree of

Master of Agribusiness Management (MABM)

Supervisor
Prof. H.P. Singh

Submitted by
Anurag Awasthi

DEPARTMENT OF AGRICULTURAL ECONOMICS

INSTITUTE OF AGRICULTURAL SCIENCES

BANARAS HINDU UNIVERSITY

VARANASI - 221005.

INDIA

ID.NO: ABM-15223 **2017** **Enrolment No.375438**

Dedicated

To

Lord Shiva

Dr. H.P. Singh
Professor

Department of Agricultural Economics
Institute of Agricultural Sciences
Banaras Hindu University
Varanasi – 221005

Ref. No. ……. **Date: ……**

CERTIFICATE

To,
The Registrar (Academic)
Banaras Hindu University,
Varanasi – 221005(INDIA)

Dear Sir,

This is to certify that the project report entitled ***"A Study On Production and Marketing of Mentha in Lakhimpur Kheri District of UP"*** *submitted in partial fulfillment of the requirements for the degree of Master of Agri-Business Management, in the Department of Agricultural Economics, Institute of Agricultural Sciences, Banaras Hindu University, is a record of bona fide research carried out by* ***Mr. Anurag Awasthi, Id. No. ABM-15223,*** *under my supervision and no part of the Project report has been submitted for any other degree or diploma. The assistance and help received during the course of this investigation and sources of literature have been duly acknowledged.*

Thanking You.

Yours faithfully,

Forwarded by

Head ***Coordinator*** ***Dr. H.P. Singh***
Chairman of Advisory Committe

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ACKNOWLEDGEMENTS

At the outset, being the student of this great institution. I bow my head with in great reverence to the lotus of ***Mahamana Pandit Madan Mohan Malaviya Ji****, the founder of the Banaras Hindu University whose everlasting desire was to serve the mankind.*

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*Last but not least, I bow my head before the feet of almighty "****Baba Vishwanath****" ****Bajrang Bali*** *and* ***Sarashwati Maa*** *seeking his blessings to accomplish the daunting task ahead in my life.*

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Chapter I

INTRODUCTION

Mentha is a plant named Mentha arvensis or common mint. *Mentha arvensis* is a European mint herb that is adopted by the United States. It is a long lasting, quick growing, hairy leaved herb that can even attain a height of 1.5 meters if favorable conditions are provided. 'Mentha' is a Latin name for 'mint'. With the help of steam distillation process, mentha oil is obtained from the fresh leaves of that plant followed by the separation of menthol from it.

In India first distillation plant was installed at Phoolbehar by a US based MNC in the year of 1973. Thereafter various local distilleries also came up at Sambhal, Chandausi and Moradabad. The survey conducted by Richardson Hindustan Ltd. determined that tarai area of U.P. would be a suitable place for the cultivation of *Mentha arvensis*. The crop of Mentha was successfully grown and when the Mentha oil was extracted by Steam distillation, mentha crop became a viable. Hindustan Richardson Ltd. established a distillation unit in Phoolbehar of district Nanital, so confidently the Farmer could grow mentha herb. They had supplied the planting materials as well as given technical knowledge to grow the mentha herb. As the result the area of mentha crops substantially increased in entire tarai and western districts of U.P. mainly Nanital, LakhimpurKheri, Moradabad, Badaun, Bareilly and recent

Domestic Scenario of Mentha oil

Mentha oil production is increasing substantially since last couple of years with more contribution from India. The large scale commercial cultivation of mentha is done in UP (Behjam,Phoolbehar, Lakhimpur Kheri, Chandausi, Sambhal, Barabanki, Bareilly, Sitapur etc.), Punjab (Jalandhar), Haryana (Ambala), Himachal and Bihar (Muzuffarpur). India produces about 32,000 tons of mentha crude oil per annum (avg. for last five years).Output is increasing in recent years and a record

production close to 50,107mt. tons is estimated for the current year 2015-16 according to Karvy. 90 percent crop review of India, grown in Uttar Pradesh, rest 10 percent review in Punjab, Haryana and Rajasthan**.** In recent year's mentha herb was developed in Madhya Pradesh. In Uttar Pardesh major menthe growing area Barabanki, Faizabad, Gonad &Bahraich, LakhimpurKheri, Moradabad.

Global Scenario of Mentha oil

The current price of natural menthol crystal is in the region of $ 38.1 to 40.0/kg; which is about 30% higher than prices for the commodity last February. It is expected that the prices of menthol may go even higher as the stock of whole *arvensis* with processors is low. The stock position of 4 out of the top 5 menthol processors from India is low and they have difficulty committing to deliveries beyond March 2015. Recent spot price movement on the MCX Futures Commodity Exchange and market sentiment suggest that the prices of whole *arvensis* is likely to increase to $ 37 to 40.0/kg. The advent of synthetic menthol in large quantities from German manufacturers is likely to change the global prices of natural menthol as the supply will outstrip demand by the year 2015-16.

India is a major exporter of Terpeneless De-Mentholated oils (TRO/DMO) and Indian Peppermint oil. The approximate volume of these commodities is about 8,000 and 1,500 MT per annum according to spice board India, respectively. The change in the prices of Natural menthol in the future is likely to adversely affect and increase the prices of these extenders significantly.

Mentha oil is derived from a plant named "*Mentha arvensis*" or common mint. It is an aromatic annual herb plant having pleasant odour leaves and is classified as an industrial crop. Mentha cuttings are sown in the month of December and harvested during March-April. The end product of Mentha oil is extracted from the mint leaves by processing and steam distillation. Mentha oil arrives in market in the month of June-July. Menthol is the major derivative product of mentha oil. Majority of the oil is converted into menthol and it is considered as one of the basic uses of mint oil. Presently India is the largest producer of mentha oil in world contributing about 73 percent of total production according to trade union 2015.

The origination of mint is not known to the people now, but it is said that it was cultivated in Europe in the ancient times. Commercially, Japan started producing mint around 1870. During that time, it was called Japanese mint and Japan was the leading country in this field. After the 2nd world war, Brazil was looked upon by some Japanese producers as mint was found in the Brazilian forests and they started producing mint in Brazil also. Likewise, the production of mint spread over other South American countries too. The production of mint was also taken over other countries of the world like China and India around 1960. In fact, initially India was an importer of menthol but after the green revolution in 1960-61, mint took off as an agricultural commodity. The cultivation of *Mentha arvensis* in India is a dramatic & very successful story. Before, 1964, there was no production of menthe oil in India. The cultivation of *Mentha arvensis* was started around 1870 in Japan.

Mentha was introduced as a rabi crop i.e. it was sown in the winter season. It continues to be the scenario currently. This crop prospers on sandy soil that is having high water content. Water logging and low rainfall provide hindrance in proper growth of the crop. Once the crop reaches the flowering stage, it is harvested as it is during this period when the oil content in plant is at its highest. The harvested crop is then dried in sun, 2-4 hours a day, till it gets reduced to one-third of its weight, and then it is sent for distillation. It is dried as the distillation of dried leaves is much cheaper than non-dried leaves. Over drying the crop may result in soaked up oil content.

Mentha can be combined with potato and maize to get a higher return and increased profitability. Harvesting is done at least twice a season.

In India there are four kinds of Mentha crop:

(i) Mentha arvensis

Initially the crop grown was called Japanies mint/ MenthaArvensis but subsequently the problems of rains & dryness, this crop was developed and known as MenthaShivalik, MSI.

(ii) Mentha piperita

The USA being the main producer of *Mentha piperita* similarly it is also called *American piperita*. Though India is developing the quality of *Mentha piperita* comparing to US crop but we have not yet been able grow successfully till now.

(iii) Mentha spearmint

(iv) Citrata (Bargamot)

Over all the production of *Mentha spearmint* & *citrata* in the world is too less.

Time of Plantation (Crop)	**Time of Plantation**	**No. of Harvesting**	**Oil yield per acre**
Mentha arvensis	January 2nd week to February Last	2	60kgs to 90kgs
Mentha piperita	December Last week to January Last	2	40kgs to 65kgs
Mentha spearmint	December Last week to January Last	2	40kgs to 70kgs

Distillation and Processing of Mentha

The oil derived from the *Mentha arvensis* herb (MENTHA OIL) by steam distillation, which is the basic raw material required for the menthol manufacture. By freezing (chilling) of Mentha oil L-Menthol (Crystals & Flakes) are isolated. In India there is two type of Menthol CRYSTALS & FLAKES, some manufacturers are processing to their shape and size BOLD (large crystals, medium crystals, small crystals, flakes in shape of powder. Rest mother liquor by centrifuging calls De-

Mentholized Peppermint oil. Menthol is main constituents in Mentha oil Rest contains menthone, methyl acetate, neo-menthol, mint terpenes, alfa-pinene, beta-pinene. L-limonene, 3 octanol, pipritone are also main contents to use as raw material to produce value added products for flavor and fragrances Industry.

The dementholized oil (DMO) is reconstituted to produce oil similar to menthe piperita oil. Several of the many dozens of terpenes present in the essential oil are valuable compounds that find uses in the cosmetic and pharmaceutical industries. Menthol itself is used as flavorings agent mouth-related products such as fresheners, tooth pastes and chewing gums, etc. Menthol mint oil because of its antimicrobial properties enhances the shelf of edible products and grains. Menthol mint oil is an essential ingredient of the ointments, pain balms, lozenges and syrups. It is also used in cosmetic preparations, colognes, deodorants, cosmetics, etc. In India, menthol and mint oil are extensively used in betel (pan) related industries.

Menthol is generally obtained by chilling mint oil and subsequent centrifuging to separate out the menthol crystals. The process may be divided into two steps, firstly menthol flakes are produced by chilling mint oil and secondly menthol flakes mixed with mint oil again chilled to produce bold crystals of menthol. The total recovery of menthol in the first step is around 70 percent. The time cycle for first step is around 6-7 days. In the second step, menthol flakes mixed with certain proportion of mint oil kept under temperature control for about 25 days. The mother liquor (conc. Mint oil) is a byproduct and can be used again till decolourisation of oil occurs. Total recovery of bold menthol crystals is about 50 percent. The details of cost involved in the distillation of Mentha oil by farmers were also analyzed and it was revealed that, small units of Mentha distillation large farmers did not go for hired distillation as all of them had their own distillation unit.

Uses of *Menthol crystal* are as follows:

Pharmaceuticals, Chewing Tobacco, Pan Masala, Perfumery Compounds, Toothpaste, Mouth Washes, Oral Preparations, Confectionery, Cigarettes

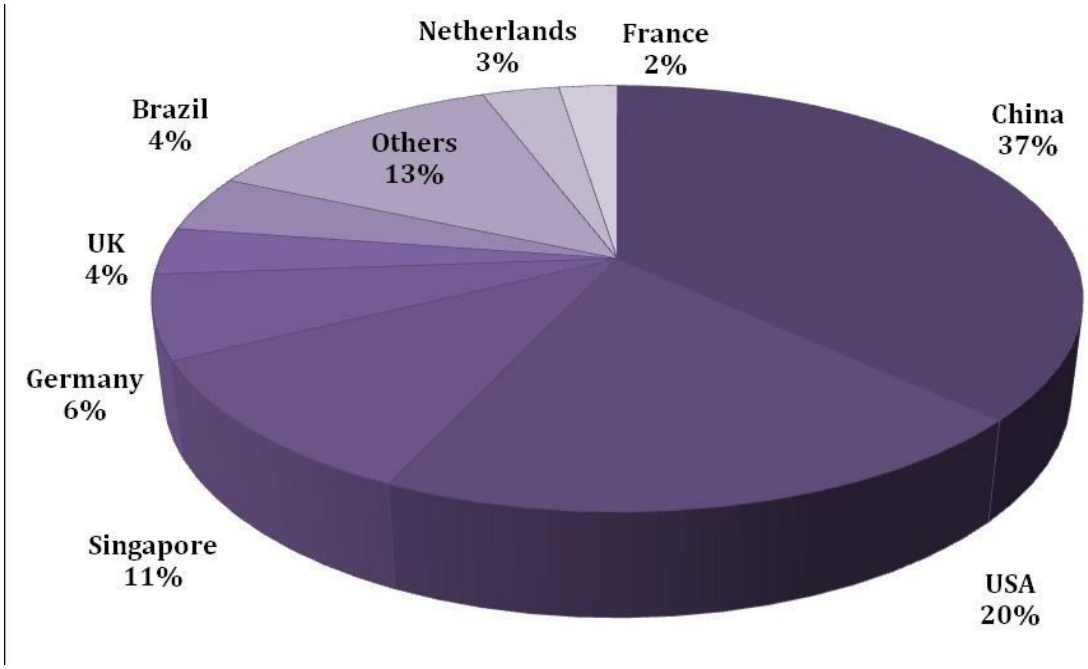
The major trading centers in India are: -

Sambhal, Barabanki, Lakhimpur Kheri, Chandausi, Badaun, Bareilly, and Mumbai.

It is also traded at the Indian commodity exchanges like National Commodity & Derivatives Exchange ltd, Indian Commodity Exchange and Multi Commodity Exchange of India ltd.

India exports around 20,000 - 25,000 tonnes in all forms of mentha oil including crystal, with the balance of production used domestically. India domestic consumption accounts for around 40% of global consumption, with China (20%), Europe (15%) and the USA (15%) accounting for the bulk of consumption. Within Europe Germany and Netherlands are major users of menthe oil. These exports have a worth of around 100 crores and earns a good amount foreign exchange to India. India exports about 16,500 tons of mentha per annum. It has recorded as high as 50,107 tons in 2015-16. Exports of mint products from India are increasing over the years, which include Menthol flakes, Menthol crystals mint oils. This could mainly be attributed to rising overseas demand for Indian produce. The major destinations for India include countries such as Argentina, Brazil, France, Germany, Japan, UK, USA, etc. Before 2001, India was not a significant player in this market. After 2007 onwards India became a major supplier of Mentha oil in the world.

Mentha oil Export from India to another Country



Source: *spice board of India in 2015*

Keeping in view of Mentha crop, the present study entitled "**A Study on**

Production and Marketing of menthe in District Lakhimpur Kheri of Uttar Pradesh" carried out with the

Following objectives.

1. **To work out the cost of cultivation of mentha crop and comperative study with other seasonal crops.**
2. **To assess the processing cost of mentha.**
3. **To examin the marketing cost of mentha.**

Chapter II

REVIEW OF LITERATURE

The comprehensive review of literature is an essential part of any scientific investigation and necessary to get acquaint ourselves with the work done in past to delineate the problem. So in this chapter a systematic attempt has been made to present chronologically all the available studies related to present investigation.

2.1 Production and Marketing Aspect

Nijjar (1995) examine the trend of mentha oil in terms of export. It was found that increased manifolds more than double in 1992-93 over 1991-92 and upward trend. Prices of mentha oil also continued to increase significantly.

Sharma *et al.* (1996) studied that the aromatic plants are the natural resource of perfumers and fragrance widely exploited by essential oil industries across the world. They are extensively used for flavoring food and drinks, for imparting refreshing tastes in pharmaceutical applications. Therefore, they can be profitably brought under cultivation in dry land agriculture, more particularly for economic crop diversification.

Ram and Kumar (1997) carried out field experiments during winter summer season of 1994 and 1995 at Lucknow, India. In experiment 1, suckers (cv. Hy 77) were planted in January and harvested twice to give two crops (planted crop and regenerated crop). In experiment 2nd, planting stock was raised from chopped suckers in a nursery and the two-month-old plants were transplanted in April and harvested once. The effects of organic wasted and/or manures on regenerated and transplanted mint crops, and of rescheduling of the harvested time in the sucker-planted crop were investigated. The treatments studied in experiment I were citronella (*Cymbopogon winterianus*) distillation waste mulch at 7 tones/ha, farmyard manure (FYM) at 20 tones/ha after the first harvest and a control (no application of mulch or FYM), supplementary to inorganic N fertilization at 180kg/ha. The harvesting times investigated in the sucker-planted crop were 90, 100, 110 and 120 days after planting (the second harvest was 75 days after the first in all treatments). In experiment 2nd , the effects of citronella

distillation waste as mulch and FYM were most effective in enhancing the total herb and essential oil yields (planted+ regenerated harvests) when the planted crop was harvested at 110 days after planting. the yield of the regenerated crop improved significantly in the plots that had received citronella mulch or FYM during the planted – crops period, as compared with that of the control, citronella-waste mulch treatment proved better than FYM treatment. Application of 160kg N/ha in the form of inorganic fertilizer and citronella distillation waste mulch at 7 tones/ha met the N requirements of the transplanted mint crop. Mulch applications improved the efficiency of utilization of inorganic N by about 10 per cent. Application of mulch had no effect on the quality of the oil obtained in the first harvested of the sucker-planted crop and in the transplanted crop. It is recommended that under subtropical conditions, citronella distillation waste mulch should be applied after the sprouting of suckers during the planted crop period to obtain higher yields of herb and essential oil from the planted as well as the regenerated crop harvests. In order to get the maximum yield advantages from both the harvests, the planted crop should be harvested at 110 days after planting. The use of citronella-waste mulch with 160 kg N/ha minimized the cost of transplanted mint production by a factor equivalent to one third.

Ram *et al.* (1998) conducted a study during summer season of 1997 at Lucknow, India. Cow pea form green maturing and green gram for grain production were intercropped with transplanted mint. The mint oil yield and net economic return with cowpea and green gram intercropping were higher by 16-18 per cent and 18-21 per cent, respectively, over pure mint crop was higher by a open in cowpea intercropped plots as compared to pure mint plots.

Singh *et al.* (1998a) revealed that the distillation in restructures in term of number of distillation plant and their installed capacities are sufficient to distil the mint crop presently being cultivated in the country. There are 9472 numbers of small and big distillation plants with a capacity to distil 15296 tones of mint oil during the distillation period of 40 days. Mint growers in general, are not aware of proper storage condition of oil which frequently leads to the determination in quality. Because of good demand of various mint oil for indigenous consumption and export, large number of people are engaged in the trading of oil mint producing areas to which farmers sell their produce without any difficulty.

Singh *et al.* (1998b) a field experiment was conducted to explore the possibilities of developing an intercropping system for menthol mint (*Mentha arvensis* L.) radish (*Raphanus sativus* L.), okra (*Abelmochus esculentus* L.) and cowpea (*Vigna unguiculata* L. walp) as intercrops improved the net economic return by Rs.20936, Rs.7439 and Rs.7028 per hectare, respectively over Rs.30808 per hectare.

Tandan *et al.* (1998) found that essential oil of the menthol mint.

Mentha arevensis. Variety Himalaya yielded 6-7 per cent higher menthol crystals and dementholated oil of superior quality in comparisons with that of the Shivalik variety.

Ram and Kumar (1999) conducted field experiments at Lucknow India, during 1993-96, to determine the conditions for mint cultivation, after rice-vegetable(s), rice-potato, and rice-legume and rice-wheat crop sequences, in the northern Indian plains. Cultivars, date of planting and density of two-month-old nursery-raised plantlets, and N-fertilizer rate were the variables. A ninety-day-old transplanted crop of the mint cv. Kalka obtained with 2.5x105 plants and treated with 160 kg N/ha gave an essential oil yield of about 164 kg/ha (about 55per cent of that of the normal duration crop of the highest yielding cv. Himalaya). The late crop of cv. Gomti could be harvested twice. The leaf stem ratio was observed to be a dependable morphological indicator of herbage maturity in the mint crops. The leaf stem ratio for a minimum essential oil yield of about 130kg per hectare varied from 1.0 to 1.5 for different cultivars. It was concluded that the late transplanting schedule of mint cropping could save at least 3month and thus allows of foods crops such as mustard, potato, grain legumes, onion, garlic and wheat to be grown in the same field prior to mint. Cultivation of one or more food crops in between rice and seedling-transplanted mint could benefit food production and bring to the farmer higher levels of profit/ha than those accruing from rice-sucker-planted mint.

Singh *et al.* (2002) survey mint growing areas during Nov. 1995 to March 1996 revealed that UP and Punjab are the major mint producing state in the country U.P. account for about 90 per cent of the total area under cultivation and production of mint oil. The total area under mint cultivation during 1995 cropping season has been 408 ha. The important area of mint cultivation are in Moradabad, Lakhimpur Kheri, Barabanki, Bareilly and Badaun Districts in UP and Jalandhar and Ludhiana in Punjab. The production of mint during 1995 growing session was 6000 tones. Moradabad remained

the highest producer of mint oil with 2838 tonesof Japanese mint oil. Followed by Lakhimpur Kheri 1530 tones, respectively.

Edris *et al.* (2003) revealed that vapours of peppermint oil and two of its major constituents (menthol and menthone), and sweet basil oil and two of its major constituents (linalool and eugenol), were tested against *Sclerotinia sclerotiorum* (Lib.), *Rhizopus stolonifer* (Ehrenb. exFr.) Vuill and Mucor sp. (Fisher) in a closed system. These fungi cause deterioration and heavy decay of peach fruit during marketing, shipping and storage. The essential oils, their major individual aroma constituents and blends of the major individual constituents at different ratios inhibited the growth of the fungi in a dose-dependent manner. Menthol was found to be the individual aroma constituent responsible for the antifungal properties of peppermint essential oil, while Menthone alone did not show any effect at all doses. In the case of basil oil, linalool alone showed a moderate antifungal activity while eugenol showed no activity at all. Mixing the two components in a ratio similar to their concentrations in the original oil was found to enhance the antifungal properties of basil oil indicating a synergistic effect.

Henao *et al.* (2008) studied to characterize the chemical composition of plant tissue in mint and its relation to the mineral concentration in soil. The fresh weight, dry weight, height and number of knots, and the elemental concentration in aerial part of plants from 35 commercial crops at the time of harvesting were evaluated, as well as the soil chemical properties. The concentration of macronutrients in the plant tissue of mint showed the next order (percent dm): K (1.07-7.23) > N (1.57-4.74) >Ca (0.66-1.36) > P (0.24-0.64) > Mg (0.14-0.60), and that one for the microelements (mg.kg-1): Fe (89-596), Mn (19-303), Zn (47-134), B (16-108), Cu (8-13). No significant relations between the nutrients in soil and plant that permit to explain, in some degree, the growth variables were found. We would find significant correlations between Mg and P in soil and their concentrations in plants (r=0,65** y 0,60* respectively) and between Mn in soil and its concentration in plant (r=-0,60*). The best correlation was found between the K/Mg ratio in soil and Mg in plant tissue (r=-0,73**) making these clear the antagonism between both nutrients and importance of cat ion balance in soil. The concentration of nutrients in mint was similar to the one reported in the other crops. In

general, we can say that soils cultivated with mint don't show limitations in regards to nutrient availability, probably, due to the intensive management of fertilization.

Mal *et al.* (2010) Studied the adoption level, costs and returns, variation in price and yield and marketing pattern of Medicinal and Aromatic Plants (MAPs). The results reveal that except in case of Mentha and Sonamukhi, the growers did not use any chemical fertilizer in cultivation of MAPs. However, FYM was used at 2-5 times more than the recommended level in all crops except Mentha. The cultivation of MAPs was not practiced as per scientific recommendation because of lack of information and ignorance of MAP growers. There is an urgent need of improved package of practices of MAPs, availability of quality planting material of high yielding and short duration varieties, more demonstration/extension efforts, timely and adequate amount of credit, establishment of processing units, timely market information, introduction of minimum support price, contract farming and participation of phyto-pharmaceutical companies to boost the cultivation of MAPs in the state. Growers should be encouraged to diversify their existing cropping system through inclusion of MAPs to enhance farm income per unit of area and time.

Singh *et al.* (2011) studied the role of medicinal plants and found that it has played a significant role in many ancient traditional systems of medication, such as the Ayurvedic and Unanic systems of India, the Chinese traditional medicine, as well as their derivatives in most Asian countries 96.67 per cent represents fully adopted intercultural operations, 93.33 per cent followed harvesting technology, 91.67 per cent followed distillation process, 88.33 per cent adopted timely irrigation and 86.67 per cent adopted high yielding variety and timely sowing. Among the other agro-technologies disseminated viz. sowing method, plant protection, fertilizer application and intercropping were lacking.

Singh and Sharma (2012) examined the problem and prospects in production and marketing of mint oil in Moradabad district Uttar Pradesh. A sample of 349 farmers was selected from four Tehsils of Moradabad district of U.P and 19 market intermediaries were interviewed through administering structured schedule. It was found on an average farmer in the study area incurred Rs.18709 per ha. Cost in growing mint and in turn realized Rs. 13368 per ha. The agencies involved in and the marketing

channels identified in the market of Mentha oil are, Channel – I: Producer – local trader – Processor, Channel – II: Producer – Commission agent – Processor, Channel – III: Producer – Wholesaler processors, and channel IV: Producer – Processor, the net price received by farmer was high when sold through commission agent (Rs.474.16/kg) as against local traders (Rs460.96/kg) however selling local traders was equally popular as the farmers need not take his produce to place of seller and thereby saving Rs. 1/kg of Mentha oil sold the profit margin earned by all the three intermediaries amounted to Rs. 172.46/kg for local traders Rs.175.51/kg for commission agent and Rs. 147.24/kg for whole sealers the marketing margins/ price spared was the highest in case of channel II (Rs.196.36/kg) followed by channel I (Rs185.65/kg) in channel III (Rs.166.00/kg) the major problem confronted by farmer in production of Mentha oil were poor technical guidance monoculture in adequate distillation facilities in minimum support from government, the problem in marketing of Mentha oil were unscientific price discovery, higher rejection rate, irregular payment of produce, high price volatility and corrupt trading practices.

Ram *et al.* (2013) Examined economics of production of three medicinal and aromatic plants, viz. menthol mint, tulsi and vetiver has been worked out using farm-level data from the districts of Barabanki, Sitapur and Raebaerli in Uttar Pradesh. The cultivation of these plant species has been found to be highly profitable and farmers of these districts need to be made aware about this fact. The net returns over total cost have been found higher for vetiver (Rs 1, 53,933/ha), followed by menthol mint (Rs 53,250/ha) and tulsi (Rs 40,094/ha). The benefit-cost ratio however has been observed to be highest for menthol mint (3.27), followed by tulsi (3.21) and vetiver (3.04). The employment generation potential of these three crops has also been found quite high. The education of farmers has been found to be influencing the cultivation of aromatic crops.

Observed that in case of all the recommended mentha cultivation technologies, the extent of adoption was higher in Barabanki district (40.34) than Lucknow district (22.91) with t-value of 7.10 which is significant at 5 per cent level of probability. The reason may be due to the fact that the mentha growers in Barabanki district had significantly bigger land holding, more knowledge on scientific cultivation practices,

better exposure to source of information like mass media, extension literatures etc. and more experienced than the growers of Lucknow district.

District wise difference in extent of adoption of mentha cultivation practices (N=120)

Scientific practices of MS of extent of adoption menthe cultivation	**Barabanki (n=60)**	**Lucknow (n=60)**	**value**
Improved Varieties	73	23.5	78**
Nursery Management	73	26.5	20**
Transplanting	1.3	82	9.64**
Nutrient Management	77	56	3.41**
Water Management	98	56	10.38
Disease & Pest Management	14	12	0.69**
Harvesting	1.25	75	7.56**
Distillation and Storage	88	75	56**
Overall Adoption Score	40.34	22.91	7.10**

* Significant at 5% level of probability,

** Significant at 1% level of probability

Chapter III

RESEARCH METHODOLOGY

A study on production and marketing of Mentha in Lakhimpur Kheri district (UP) was carried out Methodological aspect has been discussed under the following four heads.

1. Sampling technique.
2. Collection of data and method of enquiry.
3. Period of enquiry.
4 Analytical tools.

1. SAMPLING TECHNIQUE

A two stage stratified multi-stage sampling technique was used to select the block, villages and respondents (Mentha growers)

1.1 Selection of District

Lakhimpur Kheri district was selected purposively being major Mentha growing district of Uttar Pradesh

1.2 Selection of the block

There are fifteen Block in Lakhimpur Kheri district. Out of fifteen Blocks one Block Behjam was selected purposively because this block having highest area under Mentha.

1. Palia
2. Nighasan
3. Ramia Behar
4. Kumbhigola
5. Bijua
6. Bankeyganj
7. Mohammadi
8 Mitauli
9. Pasgawan
10. Behjam
11. Lakhimpur
12. Phoolbehar
13. Nakaha
14. Dhaurehra
15. Isanagar

1.3 Selection of villages: Five villages out of one hundred three villages from selected block will be select purposively where maximum number of farmer grow mentha.

1.4 Selection of Mint Growers

A list of all the mint growers for each the selected villages was prepared and categorized in three categories 0 – 1 ha marginal, 1 – 2 ha small and more than two ha medium farmers. From each category 10 percent mint producers were selected randomly. Thus the study was confined to a random sample of 25 farmers selected from five village of Behjam block, district-Lakhimpur Kheri. The number of farmers and the name of selected village are given is table 3.1

Table 1. Categories wise Distribution of sample

Village	**Size of group in hectare**				**Total**
	Marginal farmer	**Small farmer**	**Medium farmer**	**Total**	**Sample**
Barter	**1**	**2**	**2**	**5**	
Paliya	**2**	**3**	**2**	**7**	
Banika farm	**1**	**2**	**1**	**4**	**25**
Sarraiya	**2**	**2**	**2**	**6**	
Sunsi	**1**	**1**	**1**	**3**	
Sample	**7**	**10**	**8**	**25**	

1.5 Selection of Market

Generally marketing of mint was limited up to local markets due to small production. However some of the big farmers used to sale their produce in nearby regulated markets. So only those markets where the producers of the selected villages used to sale their produce were considered for the present enquiry. For the purpose one local **Barter** and

one regulated **Mandi** Lakhimpur were selected, where the selected farmers used to sale their produce of mint.

1.6. Marketing Channel

Channel-I: Producers-Local Traders-Processors

Channel-II: Producers-Commission Agents-Processors

Channel-III: Producers-Wholesalers-Processors

Channel-IV: Producers- Processors

2. PERIOD OF ENQUIRY

The study was undertaken for the years 2015-16. The study covered all farm activities adopted by the mint growers during agricultural year 2015-16.

2.2 ANALYTICAL TOOLS

Simple tabular analysis was adopted to inter the findings of the present enquiry. Besides, appropriate analytical tools were used as discussed below:

1. Cost concept as per CACP
2. Income mesure
   2.1 .Gros Income
   2.2.Net Income
   2.3. Benefit -Cost Ratio
3. Producer's share in consumer's Rupee
4. Marketing Cost
5. Marketing efficiency

2.2.1 Cost concept as per CACP

Cost A1 : it include the cash and kind expenses actually incurrent by the cultivators i.e. wages of hired human labor, charge for bullock labor, hired charges of implements and machinery, cost incurred on manures and fertilizers, planting materials, plant protection chemicals, irrigation charges, land revenue depreciation and repair charges on farm assets.

Cost A_2 : it includes cost A_1 + rent paid for leased in land.

Cost B_1 : it include cost A_1 + rental value of owned capital assets (excluding land)

Cost B_2 : cost B_1 + rental value of owned land (net of land revenue) and rent paid for leased in land.

Cost C_1 : Cost B_1 + imputed value of family labour.

Cost C_2 : Cost B_2 + imputed value of family labour.

Cost C_3 : Cost C_2 + 10 percent of managerial cost.

CONCEPTS AND DEFINITIONS USED IN THE STUDY

2.2.2. Total cost of cultivation

Total cost i.e. fixed and variable cost incurred on raising the crop of mint.

2.2.3 Fixed cost

Fixed cost includes cost incurred on family labor , rental value of land revenue , interest and overhead charges including interest on fixed capital and depreciation, repairs etc.

2.2.4 Variable cost

Variable cost includes Hired human labor, bullock labor, machinery power, cost of planting materials, fertilization, irrigation charges, plant protection measure, interest one current investment were included in variable cost.

3. INCOME MEASURES

Gross income, net income, family labour income, farm business and input-output ratio constituted the main income measures.

3.1. Gross income:

Income of farm product (Main product + by product).

3.2. Net income:

It is computed by deducting cost C from gross income.

4. BENEFIT-COST RATIO $= \frac{\textbf{Total return}}{\textbf{Total cost}}$

4. Producer's share in consumer's rupee :

The producer's share in consumer's rupee has been calculated by using formula:

$$p = Pr/Pc$$

Where: Pr = Price received by the producer

Pc = Price paid by the consumer

4. MARKETING COST

Marketing cost is the actual expenses incurred in bringing the good and services from the producer to the consumer marketing cost included, handling charges at local point, assembling charges, transport handling by whole seller and retailing charge to consumer. These cost are paid by the producer to marketing function arises.

4.1. Marketing Efficiency

It was calculated using both Shepherd and Acharya's Modified Marketing efficiency as follows –

Shephard formula

E = (O/I)* 100

Where,

E is index of marketing efficiency

O is value added by the marketing system

I is 'cost + margin' of market intermediaries

Acharya’s modified marketing efficiency (MME)

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

Where,

MME is modified measure of marketing efficiency

FP is price received by farmers

MC is marketing cost

MM is marketing margin

Chapter IV

THE AREA UNDER STUDY

The chapter is devoted for features of the area under study. In this chapter, a general background about district Lakhimpur Kheri has been dealt in detail.

5.1 DESCRIPTION OF DISTRICT LAKHIMPUR KHERI

Lakhimpur Kheri is a district of Uttar Pradesh in Lucknow division of U.P. The headquarters of the District is situated in the city of Lakhimpur. The total area that Kheri District covers is 7680sq.km. It is bordered by Nepal in the north, Shahjahanpur and Pilibhit districts in the west, Hardoi district in south and Behraich district in east. Population in the district of Kheri is 40,13,634 .In and around Kheri there are some temples which are visited by hundreds of people everyday. These are the Shiv Temple Gola, Frog Temple Oel, Shiv Temple LilautiNath and Shiv Temple Devkali.

Table No 4.1: Administrative setup of the district Lakhimpur Kheri

Tehsil Name	Total Block No. Tahsilwise	Total village No. Tehsilwise	Nyay Panchyat Blockwise	Gram Panchyat	Habitated Villages	In Habitated Villages
Lakhimpur	3	472	9	60	120	12
Mohammadi	2	487	12	82	112	2
Gola	2	672	7	44	223	8
Nighasan	3	118	9	59	250	15
Dhaurahra	2	236	7	39	197	5
Paliya	2	155	11	60	187	21
Mitauli	1	215	11	81	123	9
Total	**15**	**2355**	**65**	**425**	**1192**	**71**

5.1.2 GEOGRAPHICAL AND NATURAL OUTLINE

The district is within the Terai lowlands at the base of the Himalayas, with several rivers and lush green vegetation. Situated between 27.6° and 28.6° north latitude and 80.34° and 81.30° east longitudes, and about 7,680 square kilometres (2,970 sq mi) in area, it is roughly triangular in shape, the flattened apex pointing north.. Lakhimpur Kheri is bounded on the north by the river Mohan, separating it from Nepal; on the east by the Kaurialariver, separating it from Bahraich; on the south by Sitapur and Hardoi; and on the west by Pilibhit and Shahjahanpur

5.1.3 SOIL

Soil of district Lakhimpur comprises mainly four types of soil- sandy, alluvial soil, smooth &Domat. Geographically district can be divided in to two parts-(i) Low land (Tarai) and (ii) Upper Land (uparhar). Sandy soil is available in the bank of rivers and nearby areas. Soil of Tarai areas is clay & in dark color which is vary suitable for growing of Rice & Sugarcane. Soil of Bankeganj, Mohammadi, Kumbhi (Gola), Mitauli, Behjam&Lakhimpur Blocks is normally Domat. Important rivers flowing in the district are Ghaghara, Saryu, Sharda, Kodiyala,Ull, Gomti, Kathina, & Mohan. Length of main rivers flowing in the District is 1033 Km. The highest recorded elevation is 147m. above sea level at Lakhimpur Kheri.

5.1.4 CLIMATE AND RAINFALL

The climate is hot throughout the year except the rainy seasons. During summer(March to June), the temperature can reach above 40 °C (104 °F) and in winters(October to February) it can drop to around 4 °C (39 °F). The nights are very cold during winter and fog is very common in this season. The annual average rainfall in LakhimpurKheri is 1,085.3 millimetres (42.73 in), mostly in the monsoon months (July to sept.)

5.2 BEHJAM BLOCK

According to Census 2011 information the location code or block code 234 of Behjam village is 120. Behjam is located in Lakhimpur Tehsil of Kheri district in Uttar Pradesh, India. Lakhimpur is nearest town to Behjam village. India. It is situated on the Lakhimpur road 10 kilometres (15 mi) from Lakhimpur Kheri. percent of the population are Sikh, 35 percent are Gangwar (Hindu), and the remaining 25 percent is Muslim, Lodhi, Jatav, and Bania. The main source of income is farming, although new industries are coming, Phoolbehar is located at 28.889°N 79.266°E. It has an average elevation of

144 metres (472 feet). As of 2015 India census, Behjam had a population of 6,727 Males constitute 61.10 percent of the population and females 56.89 percent Phoolbehar has an average literacy rate of 40.47 percent lower than the national average of 59.5 percent with male literacy of 50.12 percent and female literacy of 29.38 percent of the population is under 6 years of age.

5.2.1 Land Use Pattern

Land is the most important natural resource especially mean for land use Agriculture sector. The pattern of the Block Behjam shown through the table.

Table 4.2: land use pattern in Block Behjam (2014-15)

Particulars	**Area in ha**	**Percentage**
Forest	397	0.06
Barren cultivated	45	0.00
Present fallow land	16819	2.86
Other fallow land	43	0.00
Barren and uncultivated	600	0.10
Land put to non Agric use	75795	12.9
Pasture	946	0.16
Land under miscellaneous tree and grove	5431	0.92
Net sown area	486382	82.93
Total	586458	100

Source: Economics and statistics department, LakhimpurKheri

5.2.2 Sources of Irrigation

Private tube well is found as the principal source of irrigation. As much as 84.03 per cent of land has been found irrigated by the private tube wells. Next to this is the other sources of irrigation through which 15.97 per cent of land have been found irrigate

Table 5.3 source wise irrigation in district Lakhimpur Kheri

Source	No. of irrigated resources	Percentage
Canal	16743	4.06
Tube well (Govt.)	2467	11.02
Tube well (private)	392985	84.03
Ponds	120	0.02
Other	6	0.01
Total	412321	100

Source: Economics and Statistics Department, Lakhimpur Kheri

5.2.3. MARKETING SITUATION

Markets are the pre- requisite for disposal of the surplus produce. The farmer market prices are guiding factor for allocation of area under particular crop. The crops which are more in demand in the local market are generally occupying more of the cultivable land. The market situation prevailing in the block is given below.

Chapter V

RESULTS AND DISCUSSION

6.1. STRUCTURE OF FARMS

The present study covers a sample of 25 farmers in three size group *i.e.* below 1 ha, 1-2 ha and 2 ha and above. Size of farms influences the resource use pattern, productivity and efficiency of production and marketing. Further age sex and education-wise distribution of family member and families, economic status, land use efficiency and facilities of irrigation and intensity of cropping etc. also affect the production and marketing efficiency. Therefore, an attempt has been made to analyses data on sample farms which cover various economic aspects.

6.1.1 DISTRIBUTION OF AREA AND SIZE OF FARMS

Distribution of area and size of farm is of greater importance in the study. The various cultivation practices, when it is mechanized require less human labour and if these operations are not mechanized require a lot of human labour. The holding size is supposed to be positively related with the volume of production, large size of farmers who are economically strong are in a position to adopt improved farm practices. Whereas on the other hand, the small and marginal farmers even having desired are not able to adopt these improved practices because of their poor purchasing capacity. The following table shows distribution of area and size of farm

Table 6.1.1: Composition of sample farms according to size of holding:

Size group (ha)	Number of Farms	Area covered by each group (net sown area ha)	Average size of farms (ha)
0-7	7 (28%)	4.6 (10.59%)	0.65
1-2	10 (40%)	16.27 (37.49%)	1.62
2 and above	8 (32%)	22.53 (51.9%)	2.81
All farm	25 (100%)	43.40 (100%)	5.08

It is revealed from table 3.2 that the total net sown area for all size groups which was 10.59, 37.49, and 43.40 per cent for first, second and third size group respectively. The average size of holding was 0.65, 1.62, and 2.81 for marginal, small, and large farms respectively.

6.1.2. SIZE OF FARM FAMILY

Size of farm family also plays a very important role in economic and social condition of the farmer. It has positive relationship in size of farms. More working force available in large size of farm family it may be utilized in production process and distillation process of crop. It is clear from the table 3.3 that the average size of farm family was 7.12, 8.11, and 8.92 in sample group of small and large size group with an overall average of 8.05 of all farms. It shows in case of marginal and small. The average size is smaller whereas in case of large farmers it is bigger. It further revealed that joint family system is prevalent in large farmers than small farmers. It was observed during the survey period that large farmers though their number of family member was bigger did not work as labour force but few member amongst them working on farm and few are supervised the farm.

Table 6.1.2 Distribution of family members:

Size group (ha)	Average size of family	Gender wise distribution (No)	
		Male	Female
0 – 1	7.12	4.12	3.1
1 – 2	8.11	4.01	2.2
2and above	8.92	6.21	3.12
Average	8.05	4.78	2.80

6.1.3. EDUCATIONAL STATUS

The education of a person is one of the important factors which play a significant role in use of improved cultivation practices in the farming and also play an important role in decision taking at the time of production as well as marketing of produce. At the time of survey period there was more use of improved practices found in literate farmers. In the present study, it has been observed (table3.4) that 52.40 per cent farmers are literate out of all sampled largest percentage was found in large farms group (third size group) i.e. 68.01

Table 6.1.3: Educational status of sample farm size group in percentage.

Size group (ha)	Literates	Illiterates
0 – 1	32.22	67.02
1 – 2	56.98	43.40
2and above	68.01	32.30
All farms	52.40	47.49

6.1.4. ECONOMIC STATUS

In the present study the sample population has been classified among self supporting number, earning dependents and non earning dependents and non earning dependents. It is evident from table 6.1.4 that for all farms, self supporting members, earning dependents and non earning dependents were 34.01, 34057, and 33.27, per cent, respectively. In first size group (marginal farmers) self supporting members are

highest and it is lowest in case of large farmers, further earning dependents are highest in small (second size group) farmer and non-earning dependents are highest in small farmer (second size group) and lowest in larger farmer. This was due to the fact that number of children more in case of small farmer (second size of group).

Table 6.1.4: Economic status of family member by size of farms in (%)

Size group (ha)	Self supporting members	Earning dependents	Non earning dependents
0 – 1	48.25	30.1	26.20
1 – 2	34.24	48.21	5.41
2and above	19.55	25.42	18.10
All farms	34.01	34.57	33.23

The cultivation practices used by farmer largely depend upon location condition such as socio-economic status of farmer, types of soil land holding, irrigation, facilities along with degree and adoption level of improved practices intensity, of cropping input availability at proper time as well as climatic condition. Result and discussed in following sub heads:

6.1.5. COST AND RETURNS OF MENTHA CROP

The cultivation of Mentha crop (peppermint) has crossed the boundary of traditional agriculture, Mentha crop is newly introduced in study area whereas menthe is grown for cash crop not for family consumption. The oil obtained after the distillation of crop plant has great commercial value. There is no direct use of plant as fodder etc. Because of having high content of “menthol”. Due to very high economic return from Mentha

crop, farmer are expected to take judicious decision for utilizing of available resources, knowledge and technology for production of Mentha in comparison to the other crop to be grow on their farms. These decision depend on their resource viz, soil climate irrigation and other facilities like processing (distillation unit) available in the study area. The Mentha crop is very short duration period about three months are taking from transplanting up to harvesting. Being water requiring crop irrigation facilities are very important factor in resource allocation under Mentha crop. Keeping in view the objective of the present study per hectare cost and income of Mentha crop has been worked out and presented.

6.1.6 COST OF CULTIVATION

The productivity and income from the crop can be judged in better way if we analyses it with respect to the different cost, cost incurred on its cultivation. The cost of cultivation and cost of production of any crop is the most important aspect of farm economy both at micro and at macro level point of views. From individual farmers' point of view, it helps them to read just their scarce resource more efficiently in one enterprise or to shift them to other farm enterprises in order to get better return. From national point of view, it provides guideline to the government in formulating the price policy both for factors and the produce. With above point in view, the item wise cost of cultivation per hectare of Mentha was worked out and presented in table 5.2.

Input wise cost was worked out under two broad heads namely variable cost and fixed cost. The variable cost includes cost of human labour (family and hired) bullock labour (owned and hired) tractor and machine, planting materials manure and fertilizers, irrigation charges cost of distillation and interest on working capital. On the other hand, fixed cost involves land revenues, rental values of owned land interest on fixed capital and depreciation.

It is revealed from table 5.2 that the more cost have been incurred in case of large farmers this is due to large size of farm and more use of resources i.e. machinery etc.

Table 6.1.6 Cost of cultivation (Rs. /ha)

Sr No.	Particular	Size of group in {ha]			
		Marginal (0-1)	**Small (1-2)**	**Medium (2 and Above)**	**All farmer**
1.	Labour (Land prep. And other)	6220	6700	7040	6653
2.	Sucker, Planting material	6000	6400	7200	6533
3. a	DAP	1452	1413	1500	1455
b	Urea	480	520	560	520
4.	Plant Protection	562	500	550	537
5.	Irrigation	3000	2800	3200	3000
6.	Tractor Charge	500	500	500	500
7.	Harvesting/Distillation	1200	1470	1520	1396
8.	Intrest on working capital @10 percent for 6 month	1030	1300	1470	1266
	Cost of Cultivation	**20452**	**21603**	**23540**	**21865**

The table 6.1.6 revealed that more cost have been incurred in case first size group as compared to other size groups. It was because of the fact that these farmers had done their all manual work themselves only and they have not hired at all labour. Cost of tractor and machine were highest on large size of farm and value of planting material almost the same on all size of farms. Cost of fertilizer and irrigation charge was highest on marginal farmers as compared to second and third size groups. Interest in fixed capital was highest in large size of farms and lowest in marginal farms (i.e. first size

group) likewise total fixed cost was lowest in marginal farms and highest on large farms.

6.1.7 PRODUCTION OF OIL

The oil production largely depends on various factor like size of farms, soil fertility, cultivation practices, handling of crop, distillation process and time of harvesting of menthe crop. The production of oil per hectare in each group is shown in table

Table 6.1.7: Average oil production per ha in each group

Size group (ha)	Oil in kg (per farm)	Value of 900 Rs/kg
Marginal farmer (0 – 1)	64	57600
Small farmer (1-2)	65	58500
Medium farmer (2 and above)	68	61200
Average Oil	65	59100

Net Income= Gross Return- Total Cost Of Cultivation

Marginal Farmer= 57600-20452

= 37148 Rs.

Small Farmer= 58500-21603

= 36897 Rs.

Medium Farmer= 61200-21865

= 39335 Rs.

It is clear from the table 6.1.7 that the average oil production in each group is different. The highest oil per hectare was in first size of group (i.e. marginal farmer) and lowest on the second size of group (i.e. small farmer). This is due to the more family labour incurred in handling of the crop, whereas in case of small farmer less labour is use in comparison to first size of group.

6.1.8 BENEFIT-COST RATIO

The Benefit- cost ratio is the measurement of net return per unit of input. The table 5.5 shows the Benefit-cost ratio of different size of group. Highest cost: benefit ratio was found in marginal farmers and lowest on the second size of group small farmers. Benefit-cost ratio in case of overall farmer was 1:4.663 Benefit-cost ratio in case of mentha was more than any other crop in same season:

Table 6.1.8 : Benefit- Cost ratio in each size of group

Size group (ha)	Benefit-cost ratio
Marginal farmers (0-1)	1.81
Small farmer (1-2)	1.70
Medium farmer (2 and above)	1.60
Average	1.70

6.2.1 Marketing of Mentha Oil

The marketing of oil of Mentha was not well organized in study area. This is due to small quantity of production and undefined consumer in the study area. The Mentha oil was not directly consumed. The oil is collected by different collection centre organized by commission agents who purchase oil directly from the producer. The study was conducted by assuming industry as ultimate consumer. This way there was two channels found in moving the oil (produce) from farmer (producer) to industry (consumer).

6.2.2 MARKETING COSTS, MARKETING MARGIN AND PRICE SPREAD

OIL The price of mentha oil was very fluctuating in nature. The price range was found Rs 900 to Rs 1000 per kg Price of oil fluctuated within a day, day to day and month to month. The price of oil is low at the harvesting season (i.e. Jun-July) and highest in other months.

The analyses of marketing cost, marketing margin and price spread are an important method of examining the efficiency of the market. Marketing cost include actual expenses incurred in process of marketing of the produce. Marketing margins are the net amount received by the marketing agencies as their share of profit. Price spread shows the share of producer and different intermediaries.

Here price spread has been determined for the channels -

- Producer – commission agent – wholesaler – industry
- Producer – wholesaler – industry

The table 6.2.2 revealed that marketing cost paid by producer oil collector and wholesaler are Rs.45, Rs.22, and Rs.27, respectively.

The table further showed new price received by producer is 86.58 percent of the industry purchase price.

Table 6.2.2 shows the involvement of producer and wholesaler and industry in marketing transaction. In this case producer get 81.01 per cent share of industry price which is higher to the marketing channel I

(Ttable no.6.2.2) marketing cost paid by producer and wholesaler are Rs.66.12, and Rs.46.75

Table 6.2.3 shows marketing cost Rs.66.12, paid by producer get 88.10 percent share of industry price. This shows that if the producer is in a position to sell his produce (oil) direct to wholesaler in the market he would be in an advantageous position. Therefore it be concluded that channel II is superior channel.

Table No.6.2.2: channel –I (producer – collector / commission agent – whole saller – industry)

Particular	Cost/ kg. Oil in Rs.
Price received by producer	900
Marketing cost paid by producer	45
.Processing	40
.Packaging	3
.Transport	2
Net price received by the farmer	855

Particulars	Cost/kg Oil (Rs.)
Marketing cost paid by collector	22
.Weighing charge	1
.Chemical change	1
.Packaging	17
.Transport	3
Collector Margine	40
Collector sale price/ whole saller purchase price	962

Particulars	Cost/kg Oil (Rs.)
Marketing cost paid by whole saler	27
.Transport	1
.Marketing expenditure	4
.Packaging	22
.Wholeseller	45
Industry purchase	1034

6.2.5 Marketing Efficiency

It was calculated using Acharya's Modified Marketing efficiency as follows –

Table No 6.2.5 Marketing efficiency of channel I calculated by Acharya's Modified

S.No	Particulars	Amount
1	Consumer purchase price (RP or CP)	1034
2	Total marketing cost (MC)	134
3	Total net margin of intermediaries (MM)	95
4	Net price received by farmer (FP)	855
5	Value added	39

MME = FP/ (MC + MM)

Table no. 6.2.5 revealed that in marketing channel I net price received by farmers is Rs. 855 Marketing cost and marketing margin is 134 Rs. and 95 Rs, respectively and by the using of Acharya's modified marketing efficiency formula marketing efficiency is Rs. 5.05 in market channel I.

Chapter VI

SUMMARY AND CONCLUSION

Uttar Pradesh implemented a World Bank funded Diversified Agricultural Support Project farmers of the state are diversifying their traditional agriculture to the high value crops. *Mentha arvensis* is a European mint herb that is adopted by the United States. 'Mentha' is a Latin name for 'mint'. With the help of steam distillation process, Mentha oil is obtained from the fresh leaves of that plant followed by the separation of menthol from it. In India first distillation plant was installed at by a US based MNC in the year of 1973. Thereafter various local distilleries also came up at Barter, Paliya, Kheri and Moradabad. India produces about 34,600 tons of Mentha crude oil per annum (avg. for last five years). Traders estimate India's mentha oil production at 50,107 tons is estimated for the current year 2015-16. 40% quantity remained unsold and therefore, carried over for the year 2015-16.Mentha oil price shut up to set an all time record an average of Rs 1030 a kg in March 2015 after a massive shortage in availability reported despite huge global demand. Since then the price declined steadily to reach the level of Rs 716.50 a kg in July 2015 according to karvy.

The present study attempts to examine the various factors influencing production and marketing of mentha in block Behjam, District Lakhimpur Kheri on different categories of farms with the following objectives.

1. To work out the cost of cultivation of mentha crop and cost of processing of mentha oil;

2. To study the marketing channels of mentha in the study area;and
3. To analyse the marketing cost and market efficiency of mentha in the study area.

The Behjam is important Block in district LakhimpurKheri in view of mentha oil production. The market suar Behjam comes under Block Behjam.

In the survey lists of producers (farmers) were prepared and sample farmers were selected randomly. After preparing the list of producer the farmers were

categorized in to their size of holding. Thus they were classified in to three size group.

- Producer having an area of less than 1 hectare i.e. marginal farmers.
- Producer having and between 1.00 to 2.00 hectare i.e. small farmers.
- Producer having an area of 2.00 hectare and above i.e. large farmers.

The present study is based on both the primary and secondary data the secondary information related to the study were collected from various published and unpublished sources. However primary data were collected through the personal interview of sample farmers with the help of specifically designed schedule. The period of inquiry pertains to the year 2015-16.

All available data were checked, tabulated and subjected to analytical tools to study different objectives.

As far as the sample are concerned they constituted 28 percent marginal 540 percent small 32 percent large farmer.

Net income on the basis of cost analysis per hectare. Net income on the basis of cost of cultivation and gross net income were highest on small farmer and lowest on medium farmers. As for as all farms are concerned net income on the basis of gross net income.

The Benefit-cost ratio in case of mentha in all farms was high than the other crop grown in the study area. Highest cost: benefit ratio was found in small size of group C1- 1:1.950,C2-1:1.950 and lowest on the third size of group (large farmers) 1:1.244 Cost: Benefit ratio in case of overall farmer was 1:4.663 cost benefit ratio in case of Mentha was more than to other same session crops.

Mechanization of farms is a direct measure of improvement in the socio-economic standard of farmers. Thus they have to come to the local market to sale their low volume of production.

The calculation of price spread, producers share by marketing cost, marketing margin of producer wholesaler, retailers are mentioned in table no.

The marketing efficiency have been found Rs. 6.2.2-4 in marketing channel-I and Rs. 6.2.5-6 in channel II by using Acharaya's Marketing modified efficiency.

The result revealed that the Mentha oil marketing structure was not organized. The major portion of the produce was sold in local market this organization to undertake the export of Mentha oil.

The analysis revealed that producer's share in consumer rupees is more when producer sell in to the wholesaler directly.

The yield and return in Mentha cultivation varied with the variation in the use of inputs these were higher on marginal farms as compared to small and large farms the family labour and human labour together accounted for more than 28.81 percent share in the total cost area Mentha cultivation in the study area.

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Farmer Questionnaire

General information:	
1-Full Name of Respondent:	Village:
Education:	Block:
Soil Tipe: Sandy/ Loam	District:
Irrigation: Cannal/ Tubewell	Contact No.:
2-Holding Size:	
3-(Cropping)	(Area)
Kharif	
1:	
2:	
3:	
Rabi	
1:	
2:	
3:	

Zaid
1:
2:
3:
4- If no herbicide was used, how frequently you go for manual weeding?

a) Number of times……	c) Cost of labor per day…..
b) Number of labor/acre……..	d)Number of days taken/acre.

5: Crop divers: (why Farmer is choosing menthe crop):
Driver Ranking

1. Soil Conditions
2. Water Facility
3. Cost of Cultivation
4. Crop Competitiveness
5. High Technology Adoption
6. Government Policies
7. Factory Availability
8. Market Demand