

**BEHAVIOURAL PATTERN OF VEGETABLE GROWERS
TOWARDS USE OF RANADEY MICRONUTRIENTS
IN SATARA DISTRICT**

By

JADHAV RAJESH YASHWANT

Reg. No.20162

A Thesis submitted to the

**MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI-413 722, DIST. AHMEDNAGAR
MAHARASHTRA STATE (INDIA)**

In partial fulfilment of the requirements for the degree
of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRI-BUSINESS MANAGEMENT

**DEPARTMENT OF AGRICULTURAL ECONOMICS,
POST GRADUATE INSTITUTE,
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI-413 722. DIST. AHMEDNAGAR, M.S., INDIA.**

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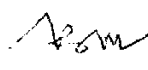
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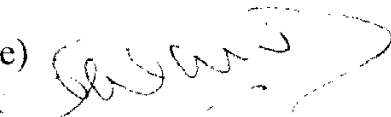
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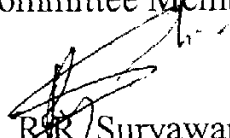
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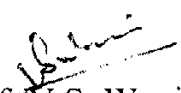
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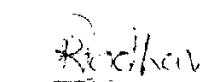
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CANDIDATE'S DECLARATION

I hereby declare that this thesis or part
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or any other person to any other
University or Institute
for a Degree or
Diploma.

Place : MPKV, Rahuri

Dated : 31/12/2002



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CERTIFICATE

This is to certify that the thesis entitled, **“BEHAVIOURAL PATTERN OF VEGETABLE GROWERS TOWARDS USE OF RANADEY MICRONUTRIENTS IN SATARA DISTRICT”** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra State in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) in AGRI-BUSINESS MANAGEMENT** embodies the results of a *bonafide* research work carried out by **Mr. JADHAV RAJESH YASHWANT** under my guidance and supervision and that no part of the thesis has been submitted for any other degree, diploma or publication.

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

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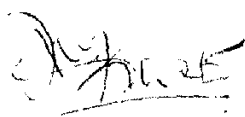
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CERTIFICATE

This is to certify that the thesis entitled, **“BEHAVIOURAL PATTERN OF VEGETABLE GROWERS TOWARDS USE OF RANADEV MICRONUTRIENTS IN SATARA DISTRICT”** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra State in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) in AGRI-BUSINESS MANAGEMENT**, embodies the results of a *bonafide* research work carried out by **Mr. JADHAV RAJESH YASHWANT** under the guidance and supervision of **Dr. D.B. Yadav**, Dy. Director of Research, Directorate of Research, M.P.K.V., Rahuri, no part of the thesis has been submitted for any other degree, diploma or publication.

Place : MPKV, Rahuri,
Date : 31/12/2002


(**D. M. Sawant**)
Associate Dean (PGI)

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Place : Rahuri.

Date : 31/12/2022

Rajhu
(R. Y. Jadhav)

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ABSTRACT

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By

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A Candidate for the degree

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Department of Agricultural Economics

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2002.

Research Guide	:	Dr. D.B. Yadav Deputy Director of Research
Department	:	Agricultural Economics
Discipline	:	Agri-Business Management

The gains of “Green Revolution” are attributable mainly to the availability of primary inputs viz., seeds of high yielding varieties, chemical fertilizers and irrigation. Among these, fertilizers occupy an important place. With the passage of time and increased consciousness among the farmers, there has been a shift in fertilizer consumption pattern. This shift is not only

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quantitative but also qualitative. It becomes, therefore, necessary to study the existing level of expenditure of farmers on fertilizers, their decision making process and thereby to find out the marketing implications if any.

The present investigation was conducted in selected ten villages from Khatav and Koregaon tahsils (five each) of Satara district purposively. Nine farmers (three each of small, medium and large category) from each of the selected villages were selected randomly and total sample comprised of ninety farmers.

The age, education, social participation, and annual income of farmers had the significant association with adoption of micronutrients. Size of land holding, occupation and size of family had insignificant association with the adoption of micronutrient fertilizers.

All the farmers were well aware of the micronutrient fertilizers. Most of the farmers got information from Krishi Seva Kendra and marketing representative of the company. The other sources were friends, neighbours progressive farmers and magazines. Most of the farmers purchased the micronutrient on cash payment.

For sale of micronutrient fertilizers Ranadey Agro Pvt. Ltd. company adopt marketing channel as Manufacturer → District distributors → Tahsil distributor → Krishi Seva Kendras → farmers. They adopted strategies for sales promotion of product like appointment of technical person as salesman at District and Tahsil level, information by technical person or staff on farm, one day training of farmers, testing soil and water pH freely

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JADHAV R.Y.

ABST. CONTD..

and giving information about actual amount of micronutrient use.

The cropping pattern of the farmers from selected area showed contribution potato, onion and tomato vegetables on large scale. Potato, Onion and Tomato crops showed 10 to 15 per cent increase in productivity due to the use of micronutrient fertilizers.

High cost of micronutrient fertilizers, non-availability in time, in required quantity and at required place, lack of information about product, lack of knowledge about which, when and how to apply, requirement of skilled labour and transportation problems were the major constraints reported by the farmers.

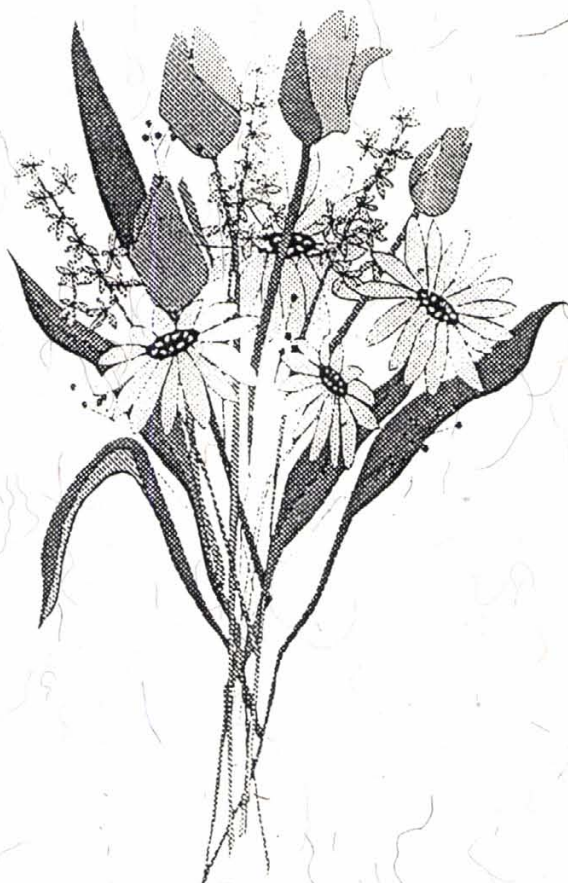
The adoption of micronutrient fertilizers is more in irrigated area and among literate farmers. There is need to draw attention in non irrigated area and among illiterate farmers through farmers rally, advertising and demonstrations.

Total Pages : 1 to 90

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Chapter Opener Page



INTRODUCTION

1. INTRODUCTION

In the words of Dr. Norman E. Borlaug, the lone noble laureate agricultural scientist, “the high yielding varieties of crop are catalyst that have ignited green revolution and the chemical fertilizers is the fuel that has powered its forward thrust.”

The production and productivity of agriculture is governed by the judicious and balanced use of farm inputs. Over and above ~~the~~ natural factors, proper and just use of inputs is crucial for production of agricultural commodities. Moreover, with the onset of green-era, the emphasis remained on the use of fertilizers to boost the yield of hybrid, improved and local strains of the different crops. The behaviours of the farmers towards the use of such inputs play important role in productivity of crops.

1.1 Fertilizers

The gains of “Green Revolution” in agriculture are attributable mainly to the availability of three primary inputs viz., irrigation, high yielding varieties and chemical fertilizers.

Fertilizer is defined as “chemical substance, which provides essential plant nutrients externally for proper growth and higher production”. An element is considered essential, if it's exclusion inhibits the growth and acute deficiency produces certain well defined symptoms which can be cured by the supply of that particular nutrient. Fertilizers occupy a very important role in

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production of agricultural produce. Fertilizers provide most of the 16 nutrient elements required by the plant for proper growth and development.

Basic nutrients viz., carbon, hydrogen and oxygen constitute 96 per cent of total dry matter of plants. The nutrients which are required in large quantities are known as macronutrients and these are N,P,K, Ca, Mg and S. Among these, nitrogen (N), phosphorous (P) and potash (K) are called primary nutrients and calcium (Ca), magnesium (Mg) and sulphur (S) are known as secondary nutrients. The nutrients which are required in small quantities are known as micro-nutrients or trace elements. They are Boron (B), Manganese (Mn), Iron (Fe), Zinc (Zn), Molybdenum (Mo.), Copper (Cu) and Chlorine (Cl) are very efficient and minute quantities produce optimum effects. On the other hand, even a slight deficiency or excess of these elements is harmful to the plants. Though micronutrients are required in traces but they are just as important as major elements.

1.2 Role of Micronutrients

The primary role of boron appears to be concerned with 'Ca' metabolism, both its uptake by roots and efficient use in plants. Deficiency shows physiological disorders like cork of apples, browning of cauliflower and heart rot of sugar beet. Manganese help in chlorophyll formation and deficiency causes chlorosis. Iron helps in absorption of nitrogen nutrient and deficiency causes interveinal chlorosis. Zinc is essential for biosynthesis of plants auxin Indole-3-Acetic Acid (IAA) and tryptophan.

Molybdenum is essential for the process of atmospheric nitrogen fixation both symbiotic and non-symbiotic. Copper acts as 'Electron carrier' in enzymes which bring about oxidation reduction in plants. Chlorine is essential in the transfer of electrons from H₂O to photo oxidized chlorophyll in photosynthesis.

1.3 Production and consumption of fertilizers

With the passage of time and increased consciousness among the farmers, there has been a shift in fertilizers consumption pattern. This shift is not only quantitative, but also qualitative. Farmers are using micronutrients with the complex and mixed fertilizers. Consumption of all nutrients during 1998-99 was 16.80 million tonnes, which increased to 18.37 million tonnes during 1999-2000, indicating 9.4 per cent increase in consumption of all nutrients over the previous year. (FAI, 1999-2000). The share of Maharashtra was 10.61 per cent in the total fertilizer consumption of India, with third position.

Table 1.1 Present consumption and projected demand for micronutrients

(Lakh tonnes)

Sr. No.	Micronutrient	Present consumption	Requirement in 2025
1	Zinc Sulphate	0.58	5.60
2	Iron Sulphate	0.81	1.50
3	Manganese Sulphate	0.04	0.54
4	Copper Sulphate	0.12	1.21
5	Boron (as borax)	0.22	1.26

Source : Micronutrient Manufacturers Association of India, 1999-2000

1.4 Ranadey Micronutrients .

Late Mr. S.N. Ranadey introduced Micronutrient fertilizer in 1961 for the first time in India. Ranadey Institute for Micronutrient Technology was started in the year 1967 in Pune with the objective to work on the nutrient requirements of commercial agricultural crops as per soil and crop specificity.

Ranadey Micronutrients group strength for conducts different activities through the following firms.

1. Institute for Micronutrient Technology : Research and Development.
2. Ranadey Micronutrients Pvt. Ltd. : Manufacturing of micronutrient fertilizers
3. Veronik Micronutrients : Manufacturing of micronutrient fertilizers.
4. Ranadey Agro Pvt. Ltd. : Marketing of agricultural inputs.

Ranadey Institute for micronutrient produces following products

A) Micronutrient spray products

- 1) Micnelf
- 2) Kiecite
- 3) Micmoll

B) Micronutrient soil products

- 1) Boracol

C) Soil conditioners

- 1) Satrite
- 2) Willase and Wilspar

The Ranadey Agro.Pvt. Ltd. sees the marketing of micronutrients in Maharashtra. In Satara district about 1.2 to 2 crores rupees of Ranadey micronutrient were sold during the year 2001 - 2002. In Khatav and Koregaon tahsils 20 lakh and 15 lakh rupees of Ranadey micronutrients were sold, respectively, during the 2001 - 2002.

1.5. Consumer behaviour

Consumer behaviour is the decision process in which individuals, groups and organizations, select, buy, use and dispose of goods, services, ideas or experience to satisfy their needs and desires. At one time, marketers could understand consumers through the daily experience of selling. But the growth of companies and markets has detached the marketing managers from direct contact with customers. Increasingly, the managers have to rely more on consumer research to understand consumer behaviour to satisfy consumer's needs and wants. The buyer's characteristics and decision process lead to certain purchase decisions. The marketer's task is to understand what happens in the buyer's consciousness between the arrival of outside stimuli and the buyer's purchase decisions. The buyer's characteristics viz, cultural, social, personal and psychological do influence buying behaviour.

To be successful, marketers have to go beyond the various influences on buyers and develop an understanding of how consumers actually make their buying decisions, the type of buying decision and the steps in the buying process.

1.5.1 Roles played by people in buying

1. Initiator - A person who first suggests the idea of buying the product or service.
2. Influencer - A person whose view or advice influences the decision
3. Decider - A person who decides on any component of a buying decision - i.e. whether to buy? what to buy? how to buy? where to buy?
4. Buyer - The person who makes the actual purchase.
5. User - A person who consumes or uses the product or service.

1.5.2 The stages of Buying Decision Process

The consumer passes through five stages,

1. Problem recognition - The buying process starts when the buyer recognizes a problem or need. The need can be triggered by internal or external stimuli.
2. Information Search - An aroused customer will be inclined to search for more information about product.
3. Evaluation of alternatives - Available information can be employed to evaluate the alternatives (products / brands). This is a critical stage in the process of buying particularly for costly and durable goods.
4. Purchase decision - While the consumer is evaluating the alternatives, he develops some likes and dislikes for the alternative brands, influences the

intention situational factors, perceived risk of the product and other factors.

5. Post purchase behaviour - The brand purchased and the product used provide feedback of information regarding the attitudes if the level of satisfaction derived is as per expectations, it will create brand preferences influencing future purchases. But if the purchased brand does not yield desired satisfaction, than negative satisfaction will create anxiety and doubts.

1.5.3 Benefits of consumer behaviours to the marketer

1. Knowing the initiator, influencer and decider in the buying process.
2. Identifying the circumstances that trigger a particular need. By gathering information from number of consumers, marketers can identify the most frequent 'stimuli' that spark an interest in a product category. The marketer can then develop marketing strategies that trigger consumer interest.
3. Identifying the major information sources to which the consumer will turn and the relative influence each will have on the subsequent purchase decision(s).
4. Trying to influence the consumer buying decision and to know, how consumer's own knowledge of persuasion techniques may guide the weighing of certain aspects of an advertising campaign or sales presentation.

5. Understanding the factors that provoke a feeling of risk in consumers and provide information and support to reduce the perceived risk.
6. Knowing the past purchase behaviour and taking steps to minimize the consumer's post - purchase dissatisfaction.

1.6 Objectives

The specific objectives of the study are

1. To study the behavioural pattern of vegetable growers towards purchase of various brands of micronutrient fertilizers.
2. To study the sales promotional strategies adopted by manufacturer.
3. To study the effects of use of micronutrients on the productivity of vegetables.
4. To identify the constraints encountered by the farmers in use of micronutrient fertilizers.

1.7. Scope and Utility of the study

Despite the fact that there is consciousness among farmers for the use of fertilizers, there still exists a big gap between what it is and what ought to be. To feed the ever-increasing population and to export, there is a need for more production which can^{be} achieved through more use of fertilizers, irrigation, high yielding varieties, etc. The entry of complex, mixed and micronutrient fertilizers is likely to pose certain problems of acceptance to desired scale. To solve this problem, it becomes necessary to study existing use level of fertilizers,

prepurchase activities, decision making process and thereby to find out the marketing implications.

The findings of the study will be helpful in understanding the farmers behaviour towards the purchase of micronutrients for vegetables. The study will be useful to understand the effect of micronutrient on production of vegetables. Moreover, it will focus on constraints faced by the farmers in purchasing the micronutrient fertilizer. The result will be of great help in formulation of production oriented strategies for vegetable cultivation.

Chapter Opener Page



REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

The farmers have realised the importance of micronutrient fertilizers in the production and productivity of crops. However, the use of micro-nutrient fertilizers is affected by the wide variations and fluctuations in the irrigation facilities and prices of fertilizers. A review of various studies in relation to farmers behaviour towards fertilizer use done by researchers in the past is necessary and helpful in proceeding further in the right direction. This chapter reviews the literature on results arrived at in similar studies carried out by different researcher in the past. The literature relating to the study is divided into following sub-heads.

- 2.1 Socio-economic characteristics of farmers.
- 2.2. Sales promotional strategies adopted by manufacturers.
- 2.3. Effects of use of micronutrients on the productivity.
- 2.4. Constraints encountered by the farmers in use of micronutrient fertilizers.

2.1 Socio-economic characteristics of farmers

Singh and Singh (1968) studied attitudes of farmers towards the use of chemical fertilizers. They found that 94 per cent respondent used fertilizers because farmyard manure was not adequately available. 91.60 per cent respondents believed that chemical fertilizers were easiest way to increase the crop yield. 72.80 per cent respondents denied that the use of chemical fertilizer in food crop was harmful for health. 73.60 per cent farmer's believed the use of fertilizers improves the quality of grain and got better prices in market. 59.20 per cent farmer opined that the use of chemical fertilizer did not deteriorates the taste

of food, while 36.40 per cent respondent were opposite of it, 56.40 per cent respondents opined that fertilizers did not made the soil poor, while 42 per cent respondents believed fertilizers made the soil poor. The overall attitude towards fertilizers was very favourable. They further found that the upper socio-economic status group (better economical, educational etc.) were having most favourable attitude followed by middle and lower socio-economic status group. The young age group showed favourable attitude towards fertilizers than the old age group.

Karim et. al. (1974) studied relationships of selected characteristics of transplanted Amman rice growers with their adoption of fertilizers in rural area in Bangladesh. They found that there was no correlation between age and adoption of fertilizers. They further noticed that 69 per cent of the total growers were illiterate and 31 percent were literate and found a positive relationship between literacy and adoption of fertilizer. They found 55 per cent farmers had small farm (less than 3 acres), 33 percent medium farm (3 to 5 acres), 12 per cent large farms (above 5 acres) and they noticed highly positive relationship between farm size and adoption of fertilizer. Out of the total growers, 13 per cent had low organizational participation, 5 per cent medium and 4 per cent high participation. There was positive relationship between organizational participation and adoption of fertilizers.

Joshi (1977) studied adoption of chemical fertilizers and improved manuring techniques in Western Rajasthan. He found most of the farmers were aware about ammonium sulphate, calcium ammonium nitrate, single super phosphate and green manuring. But they had a detailed knowledge about the use of ammonium sulphate and calcium ammonium nitrate only. However, he found

ammonium sulphate and calcium ammonium nitrate were tried by almost two thirds of the farmers but only about half of them had adopted these. He further noticed that the adoption of fertilizers was highest in middle age group (36-44 years) followed by older age group (45-54 years) and younger age group (25-34 years). He also found membership and participation in different institutional activities have positive correlation with adoption of fertilizers. Land holding and irrigation facilities were also found positive correlation with fertilizer adoption. Further, he noticed that 40 per cent farmer believed that the fertilizers improve soil fertility and grain quality. While 60 per cent of the farmer rejected chemical fertilizers because of lack of irrigation facilities, technical know how and shortage of funds.

Khare and Singh (1989) studied the socio-economic determinants of fertilizer consumption. The study was conducted in Manipur and Etawah district of Uttar Pradesh. They observed literacy was a major determinant of nitrogenous fertilizer consumption. The information source and extension exposure were the significant determinants in nitrogenous and potassic fertilizers consumption, while above factors did not showed significant determinants for phosphatic fertilizers consumption.

Choudhury et.al. (1991) studied attitude of farmers towards chemical fertilizers and HYV of paddy. The study was conducted in Sochunoma village. They found that family size and education of the family did not showed any contribution in adoption of fertilizers. While age of the family head and extension contacts showed association. They further noticed that holding size, education and social participation of the family head showed higher attitude towards

chemical fertilizer, while extension contact, family education and agricultural income showed negative attitude towards chemical fertilizers.

Dhas (1995) studied the influence of the social values on the adoption of improved cultivation practices of selected crops namely sugarcane, jowar and wheat in shevgaon tahsil of Ahmednagar district. He noticed that education had significant association with the adoption of improved cultivation practices.

Pawar (1996) studied farmers behaviour towards use of fertilizers in Vidarbha region of Maharashtra. He found that 35 per cent respondents had low income while, 65 per cent had high income and found positively significant relationship between annual income and expenditure on fertilizer. Further he noticed that 41.67 per cent farmers had small size of holding and rest 58.33 per cent had large size of holding and expenditures on fertilizers. He found that 38 per cent farmers had less irrigated land, while 61.67 per cent had large size of irrigated area and found positively significant relationship between size of irrigated area and expenditure on fertilizers.

Pande and Kushwaha (1999) studied the differential attributes of potato growers in relation to their adoption behaviour. The study was conducted in Panna district of Madhya Pradesh. The adoption behaviour of potato growers was taken as dependent variable and various personal, psychological, socio-economic, technological and communicational attributes as independent variables. The adoption behaviour of potato growers was low, medium and high (63.34, 23.33, 13.33 per cent), respectively. It revealed that the potato growers had low adoption behaviour. This might be because of non-availability of appropriate technology in time, moderate socio-economic status, knowledge of

potato production technology, innovation, exposure to different sources, economic motivation and low extension participation.

Borkar and Chothe (2000) studied characteristics of farmers influencing their knowledge about use of Bio-fertilizers. The study was carried out in 15 villages of Nagpur panchayat samiti for Nagpur District. They studied the relationship between selected characteristics of farmers and their knowledge of use of bio-fertilizers. They studied characteristics of farmers like age, education, land holding, annual income, socio economic status, risk preference etc. They observed that education and communication variables exerted influence on knowledge about use of bio-fertilizers. They also found significant association between use of bio-fertilizer and the characters like age, land holding, annual income, socio-economic status, etc.

Saxena and Singh (2000) studied the adoption of organic farming practices by farmers of Malwa Region. They studied extent of adoption of organic farming practices. The level of adoption low, medium and high is 25.45, 40.90, 33.65 per cent, respectively. They also studied problems faced by farmers during adoption of organic farming practices. The problems like unavailability of good quality material at the time of sowing have been a major problem expressed by 75 per cent farmers, followed by lack of knowledge 63 per cent. About 41 per cent farmers expressed lack of awareness about the technology.

The socio-economic characters are most important to study the behaviour of farmers. The socio-economic characters like age, education, income, land holding, input sources, social participation, source of information, etc. are the

deciding factors for adoption of new technologies in cultivation of crops. This character helps to improve the decision making ability of the farmers.

2.2 Sales promotional strategies adopted by manufacturers.

Biswas and Tewatia (1988) studied the micronutrient status in Indian agriculture and suggested that industry should encourage the use of micronutrient along with macronutrients to get higher use efficiency. Literature written in simple language with colored photographs of micronutrient deficiency should be produced and distributed among extension workers, dealers and farmers. Field demonstration is the best method of farmers education and it should be intensively done in micronutrient deficient areas.

Maheshwari and Misra (1995) studied marketing and logistics of fertilizer in an open environment. They found that company product must be straight and mixed, company must use backward, forward or horizontal integration, and packing must be economic, convenient and promoting. Sell must be through all channels i.e. selling through agricultural graduates or village opinion makers. The company must have its own 'Economic zones' for maximizing sales. For the customer satisfaction it found better to monitor the performance of order processors, warehouse planners, inventory managers and transportation managers. For wide publicity of product, company must be use Radio, exhibitions and own documentaries. Transportation and warehousing items contributed about 60 per cent of the total marketing cost. It found better to make use of rail for long distance and for short distance, the road facility.

Singh (1995) studied advertising and sales promotion under total fertilizer decontrolled scenario. After decontrol he found that the prices of N, P

and K shot up by 20 and 250 per cent respectively while consumption of P and K dropped by 13.5 and 30.7 per cent, respectively. Under such situation he found that outdoor painting such as wall painting, shop painting, khoka painting, tractor trolley painting, road side boards, hoardings, news paper advertisement, jeep campaign, magic show, farmers fair, balloon hoisting were found to be most effective for promotion. It was also found that magic show made 182 per cent more contact with farmer than individual contact. Film of 30 and 60 seconds duration in cinema hall, nukhad show, sponsoring rural sports like volley ball, kabbadi, wrestling, horse racing, cycle racing and naming the tournament and trophy with product name were found to be create strong brand awareness. He also found effective to gave gift to the dealers and visiting once in 15 days. Further he suggested to sent mailers (Letters, Magazines) to the identified customers and consumer with regard to product, company's marketing policy, technical aspects of product use so as to bring the group of customer and consumers under company's fold.

Singh (1995) studied fertilizer extension and promotion strategies under total decontrolled scenario. He found that after the decontrol, the prices of fertilizers increased by 40 per cent. Under such situation, he found some extension activities helped to increase fertilizer use. Established farmers service centres with multi input retail outlet operated by agricultural graduates were found effective. The primary command area of service centre was for 10 villages within 5 km radius and learning by doing extension activity was found effective. The secondary command area of service centre was for 20 villages within 10 km radius and learning by seeing extension activity was found effective. One contact farmer

appointed in each village for interaction, block or crop demonstration, soil testing, farmers training camp, farmers tours, fair and exhibitions, balanced fertilizer use through soil testing recommendations, integrated nutrient supply, integral part of package of practices, etc. were found effective for promotion.

Iyer and Chennanesavula (1996) studied Coromandel's philosophy of sales promotion for the pre-and post-decontrolled period. They found that audio visual vans with 16 mm projectors, TV/VCPs, slide projectors, flip charts were more effective to educate both literate and illiterate groups. The media was found best to gain consumer confidence and established company's image. Result oriented demonstration was also found effective for motivating the farmers for fertilizer use. Soil testing service was found to be the best means for helping farmer and gaining their confidence. The mass media programmes like advertisement, radio, film, TV, wall painting, roadside hoardings, posters, stickers, tin plates, glow signs, calendars, leaflet's, etc. were found more effective for establishing brand image and creating product awareness, particularly in the initial stages of introduction.

Rane (1996) studied promotional strategies of DFPCL. (Deepak Fertilizers and Petrochemicals Corporation Ltd.) He found that the sales programmes were carried out through agricultural graduates and distributed company product personally to the farmers. This programmes created good image of company for its product. Spot demonstrations were carried out on farmers field, which fascinated to compare the efficiency of products and also gave wide publicity of the brand and products. Soil test camps were conducted to reach farmers door and get the feedback on use of soil test based fertilizer use. DFPCL

also conducted farmers and dealers training programme to inform about the use of P, K, secondary and micro-nutrients.

Shanmugam (1996) studied fertilizer promotion by FACT in Kerala. He found that the fertilizer festival in which soil testing, discussions with scientists, information about tractors and bullock arts were effective to promote fertilizer use. FACT started village adoption scheme in 1968 through agricultural service centre, which supplied seeds, fertilizers, pump sets to the farmer under "Squade programme". Personal contact was the most effective way of disseminating the fertilizer use technology amongst farmers. Crop campaigns, crop seminars with scientists, group discussions, soil testing, dealer training, block demonstration, seed farms, agricultural seminars, study classes, exhibitions, study tour, soil testing, crop competitions, agroforestry, etc. were organized and he found that 15 per cent annual increase in fertilizer consumption. 16 mm and 35 mm advertisement films were showed in rural areas, which created a good awareness about fertilizers. Printed leaflets, pamphlets, handouts, direct mailing, letters with optimum dose of fertilizer were also found effective for efficient use of fertilizers. Hoardings, wall paintings, banners, posters, boards and stickers were found effective to attract the attention of passer-by.

Shrivastava (1996) studied the promotional activities of HCF (Hindustan Fertilizer Corporation). He found that the HCF carried out Indo German fertilizer education project (IGFEP) to promote balance use of fertilizers, popularise complex fertilizers and increase consumption level of fertilizers. Under this project, it was found that the consumption of nutrient increased from

10.2 (1970) to 34.60 kg/ha (1980) in West Bengal. HCF also carried out Indo British fertilizer education project (IBEEP) to demonstrate effect on yield through application of recommended fertilizers in Orissa, M.P., West Bengal, Bihar, U.P. and Assam. During this project, it was found that the consumption, of fertilizers increased by 182 per cent while during the post demonstration period, consumption increased by 82 per cent. HCF also started Bio-fertilizer production unit, Krishi Vighan Kendra, heat camping and mobile shops for providing small package of fertilizer to farmer.

Singh (1998) studied relevance of extension education and fertilizer promotion changing market scenario. He found that to setup network of agro-input service centre in the economic zone of the company, extension programmes like soil testing, farmers training camp, crop demonstration, field day, farmers conducted tour, campaign meeting, etc were more effective in the zone. In secondary zone they found that it was slightly away from economic zone .In the zone, they saw that the marketing of fertilizer was found more effective through 'change agent' scheme. The opportunity zone, which was beyond economic and secondary zone, was found economical for company for providing only support services like soil testing, meeting and training programmes with help of audio visual and technical literature.

The strategies like distribution of literatures to farmers, farmers training camp, block demonstration, soil testing, fair and exhibitions, economic package of product, advertising by wall painting, shop painting, tractor trolley painting, roadside board hoardings, news paper advertisement, jeep campaign,

balloon hoisting, personal contact to farmers, training programmes, audio visuals, result oriented demonstrations were most effective for promotion of products sale.

2.3 Effects of use of micronutrients on the productivity

Kotur (1994) studied effect of liming and modes of molybdenum (Mo) application on the response of cauliflower to molybdenum. The soils of Chhotanagpur plateau are highly leached ultisols; acidic in reaction and deficient in available Mo. Soil application of 1.0 to 1.5 Kg Mo ha⁻¹ to cauliflower significantly increased the curd yields by 14-18 per cent although the whiptail malady (Mo. deficiency) caused was 1-2 per cent only. Foliar sprays of micronutrients are convenient, quickly absorbed and most effective when soil conditions are not favourable for soil application.

Trehan and Grewal (1995) studied effects of zinc, copper and Iron and their critical levels for potato. Experiments were conducted at Jalandhar (Punjab) in 16 fields for Zn, 13 fields for Cu, and 12 fields for Fe to measure their responses and determine their critical limits for potato (cv. kufri, chandramukhi) on alluvial soil. The responses were 56.0 per cent for zinc, 61.5 per cent for copper and 75 per cent for iron. Foliar spray of the micronutrients at 30 and 50 days was equally effective as against the soil application. The critical deficiency limits for potato established by statistical procedure of Cate and Nelson were 0.75 mg Kg⁻¹ soil of DTPA-Zn 0.32 mg Kg⁻¹ soil of DTPA-Cu and 6.6 mgKg⁻¹ soil of DTPA-Fe.

Selvi and Perumal (2000) studied effect of micronutrient fertilization on brinjal yield. The pot culture experiment was conducted in the green house of the Department of Soil Science and Agricultural Chemistry, Tamil Nadu

Agricultural University, Coimbatore with brinjal variety Coimbatore vari kathiri. The soil application of straight micronutrients recorded higher brinjal yield compared to the foliar application. The brinjal fruit yield increased from 384.2 to 664.2 of plant. The fruit yield was significantly influenced by microfood application.

Shelge et al. (2000) studied influence of micronutrients on yield of soybean. They selected Marathwada area for the relative study. They found that the application of macro and micro nutrients to soybean improved yields only over the application of macronutrients. The supplementation of macro nutrients by micro nutrients and FYM appreciably exalted the relative yield.

Shukla and Lal (2000) studied the effect of 'S' and 'Zn' deficiency in rice and coarse cereal based cropping systems. An expenditure of one rupee on zinc through 'ZnSO₄' generated a net gain of Rs. 3.0 to Rs. 8.0 in sequences tested at respective locations. Using 5 Kg/ha of 'Zn' through ZnSO₄ earned a net income of Rs. 1303/ha to Rs. 4184/ha showed superiority over 5 kg/ha Zn through Zn Cl₂. The result suggests that if immediate steps are not taken to remove sulphur and zinc deficiency, it will cause reduction in crop productivity.

Singh et al. (2001) studied effect of boron application on yield of pea and black gram. The calcareous soils are deficient in boron content. Its deficiency affects yield of different field crops. The application of boron increased the grain yield of pea and black gram significantly. The maximum grain yields of both the crops were obtained at 4.0 kg borax /ha. The yield of pea and black gram was 18.35 q/ha and 16.26 q/ha respectively. The study revealed that 'Bo' application is necessary to obtain higher yields of pulses in calcareous soils.

The soil application of molybdenum (Mo) to cauliflower significantly increased the curd yields, potato gives good response for zinc (Zn) Copper (Cu), and iron (Fe). Boron application is necessary to obtain higher yields of pulses in calcareous soils. It can be said that the micro nutrient fertilizers application with macro nutrient and FYM gives better yield.

2.4. Constraints encountered by the farmers in the use of fertilizers

Phatka (1971) found that cost of fertilizer, residue effect and availability were the main constraints in fertilizer use in Haveli tahsil of Pune district.

Datta et. al. (1985) observed that constraints in the use of fertilizers in West Bengal. They reported that lack of irrigation and inadequate extension services were the major constraints in the use of fertilizers.

Girase and Kamble (1991) studied constraints in adoption of fertilizer and plant protection measures in dryland bajra cultivation. Lack of knowledge of, when, which, and how much fertilizer to be used and high fertilizer cost were the constraints. Non-availability of desired fertilizer was reported by 50 per cent of traders from West Godavari and Adilabad districts and 33.34 per cent from Chittoor district.

Kute and Haria (1991) studied nutrient balance and sustainable agriculture in Gujarat plains and hills and concluded that the ignorance and unawareness on the part of farmers about the soil fertility status and deficiency of major, secondary and micronutrients, were the major constraints.

Morankar (1995) studied the constraints in the use of fertilizers for irrigation crops viz., sugarcane and wheat in Ahmednagar district of Maharashtra. He found that unawareness of balanced use of fertilizers, increased prices, insufficient water supply were the main constraints.

Kor (1998) found that poor distribution of rainfall, poor infrastructural facilities, lack of awareness of fertilizer use were the main constraints in fertilizer use in North Eastern States of India.

Raghuram and Chaudhary (1999) studied the comparative performance of private and co-operative retail outlets in fertilizer supply in West Godavari, Chittoor and Adilabad districts of Andhra Pradesh. They observed that non-availability of desired fertilizer was a problem reported by 50 per cent of traders from each West Godavari and Adilabad districts and 33.34 per cent from Chittoor district. They also noticed that private traders were ahead of co-operatives in supply of desired product, timely supply, credit sales and extension of technical know-how.

Chothe and Borkar (2000) studied constraints faced by farmers in adoption of bio-fertilizers. The study was conducted in Nagpur district. they observed that the lack of knowledge about bio-fertilizers was major constraints encountered by 61.33 per cent of respondents. Low income was the constraints expressed by 25 per cent respondents. Approximately 42% of respondent stated that due to lack of demonstration facility.

Singh and Rajput (2000) studied constraints in adoption of wheat production technology. The study was carried out in Indore district of M.P. They concluded that lack of irrigation facility (71.42 per cent), low price for farm product (69.52 per cent), lack of communication (60.95 per cent), lack of capital

(59.04 per cent) and high prices of fertilizer (53.33 per cent) were the major constraints faced by the farmers.

The factors viz. cost of fertilizers, residue effect, non-availability, lack of irrigation, inadequate extension services, ignorance and unawareness about fertilizer application and low income are the major constraints for the farmers in the use of fertilizers.

From these reviews one knows which kind of characteristics of farmers to be studied for test of behaviour for the decision making process about the purchase of products, adoption of technologies by the farmers. Strategies adopted by the manufacturer to promote sales. The reviews also revealed the effects of micronutrients on the productivity of the different crops and the constraints encountered by the farmers in use of fertilizers.

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METHODOLOGY

3. METHODOLOGY

The present chapter outlines the methodology adopted for the study. It deals with the selection of the study area, selection of sample farmers, data requirements, sources of data, collection of data and analytical procedure adopted to fulfil the objectives of the study.

3.1. Selection of the study area

The area covered for the study is the Satara district of Western Maharashtra, which is purposively selected. While consulting with Ranadey micronutrient company it was came to know that sale of micronutrient is increasing in Satara district due to increase in acreage under onion, potato and other vegetable crops, so Satara district was selected as study area.

3.2. Selection of Tahsils

The area under vegetable in Satara district is concentrated in Wai, Satara, Phaltan, Koregaon, Khatav, and Karad tahsils. In Khatav and Koregaon tahsil onion and potato vegetables are mostly grown. In Khatav there are two distributors of Ranade micronutrients and one in Koregaon. As such Koregaon and Khatav tahsils having more sale of micronutrients fertilizers were selected purposively.

3.3. Selection of Villages

From each tahsil, five villages which having more area under vegetable crops and more sale of micronutrient fertilizers were selected. Koregaon Tahsil : Kumthe, Karanjkhope, Jalgaon, Rahimatpur and Sonake. Khatav Tahsil : Budh, Ner, Pharthadewadi, Palshi and Nagche Kumthe

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3.4 Selection of farmers

From each selected village, 9 farmers were selected randomly. All 90 farmers spread over two tahsils were selected for the study. The farmers were grouped into three categories on the basis of operational holdings.

- i) Small farmer - Up to 1 ha.
- ii) Medium farmer - 1.1 to 2.5 ha.
- iii) Large farmer - 2.6 ha. and above.

3.5. Collection of data

The data from the sample vegetable growers were collected with the help of designed questionnaire by personal interview method. The importance and the objectives of the study were clearly explained to them and were assured that the information furnished by them would be used for research purpose only. They were contacted at their homes or on farms to get the information. The data were collected for the reference year 2000-2001.

3.6 Analytical frame

3.6.1. Measurement of independent variable

I) Personal variables

a) Age

Chronological age at the time of interview was taken into consideration. The respondents were classified into three age groups viz.,

- 1. Young - Upto 35 years.
- 2. Middle - Between 36 to 50 years.
- 3. Old - Above 50 years.

b) Education

It is the level of formal education of the farmers. Accordingly they were classified into following five categories.

1. Illiterate - having no formal education.
2. Primary - up to 7th standard.
3. Secondary - 8th to 10th standard.
4. Higher Secondary - 11th to 12th standard
5. Graduate -

c) Size of family

Considering the number of members in the family, respondents families classified into following categories.

1. Small family - up to 5 members
2. Medium family - 6 to 7 members
3. Large family - above 7 members

II) Social Variable

a. Social participation

It refers to the participation of respondent in formal and informal organizations such as Grampanchyat, Panchyat samiti, Zilla Parishad, Co-operative societies, Co-operative dairys etc.

1. No social participation.
2. Low social participation.
 - member of Grampanchyat,
 - member of youth club and other organisations.
3. Medium social participation

- Chairman of co-operative credit society, Chairman of
- youth club, Ganesh Mandal, etc.

4 High social participation

- Sarpanch / Deputy sarpanch of Gram panchayat,
- Director of sugar factory.

III) Economic variables

a) Size of land holding

It refers to the number of hectares of land owned, cultivated and managed by farmer. Primarily ten villages were selected which are potential for vegetable growing and nine farmers were selected from each village which are growing vegetables. So ninety farmers were categories in to thirty small, thirty medium and thirty large as per the size of holdings.

1. Small farmer - Up to 1 hectare
2. Medium farmer - 1.1 to 2.5 hectares
3. Large farmer - 2.6 hectares and above

b) Annual income

It is the total gross income of farmer and his family from main and secondary occupations and other sources. According to annual gross income, the respondents were grouped into three categories.

1. Low income group - up to Rs. 50,000
2. Medium income group - Rs. 51,001 to 1,50,000
3. High income group - above Rs. 1,50,001

c) Occupation

1. Farming
2. Farming + Service
3. Farming+ Business .

3.6.2. Dependent variable

1) Adoption

Adoption is the process which involves the decision making i.e. whether to adopt an innovation. The variable adoption is calculated by how many sample farmers adopted the micronutrients and then calculating their percentage to the total number of sample farmers. The association between adoption and various variables was tested at 5 per cent level of significance.

1. Low adoption
2. Medium adoption
3. High adoption

3.7. Multiple Linear Regression Model

An attempt was made to estimate the factors affecting the productivity of vegetable crops by fitting the multiple linear regression model.

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + u$$

Where,

Y = Yield (qtls)

X_1 = Quantity of Nitrogen fertilizer (kg)

X_2 = Quantity of Phosphorous fertilizer (kg)

X_3 = Quantity of Potash fertilizer (kg)

X_4 = Quantity of Iron fertilizer (kg)

X_5 = Quantity of Manganese fertilizer (kg)

X_6 = Quantity of Zinc fertilizer (kg)

X_7 = Quantity of Copper fertilizer (kg)

X_8 = Quantity of Boron fertilizer (kg)

X_9 = Quantity of Molybdenum fertilizer (kg)

a = intercept

b_i = regression coefficient

u = error term.

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**GENERAL
INFORMATION
OF THE STUDY** Area

4. GENERAL INFORMATION OF THE STUDY AREA.

It is essential for the research worker to get acquainted with the tract under study. Agricultural production is dependent on many climatic and geographical factors like temperature, rainfall, soil type, etc. In fact, the entire planning of farming is done on the basis of these factors. The background information about the tract under study facilitates the reader to understand the results of research in more effective manner. With this view, the general information of the study area is described in the present chapter.

4.1. Physical features

Satara district is situated to the western side of deccan plateau and lies between 17⁰5' to 18⁰11' Northern latitude and 73⁰34' to 75⁰54' Eastern longitude. Some part of the Satara district is situated in Bhima basin and majority of the part is situated in the Krishna basin. Satara district is surrounded by Pune district on Northern side, Solapur district to Eastern side, Sangli to Western side and Raigad to North Western side. Total geographical area of the district is 10484 square kms covering 3.4 per cent of the total geographical area of the State. Satara district stands 15th in the state of Maharashtra, as far as geographical area is concerned.

4.2. Population

The male and female population of the district was 49.29 and 50.71 per cent of the total population respectively. Total population of the district was 2,45,1000 as per 1991 census 87 per cent of the total population was living in rural areas and literacy percentage was 66.67 per cent in the district.

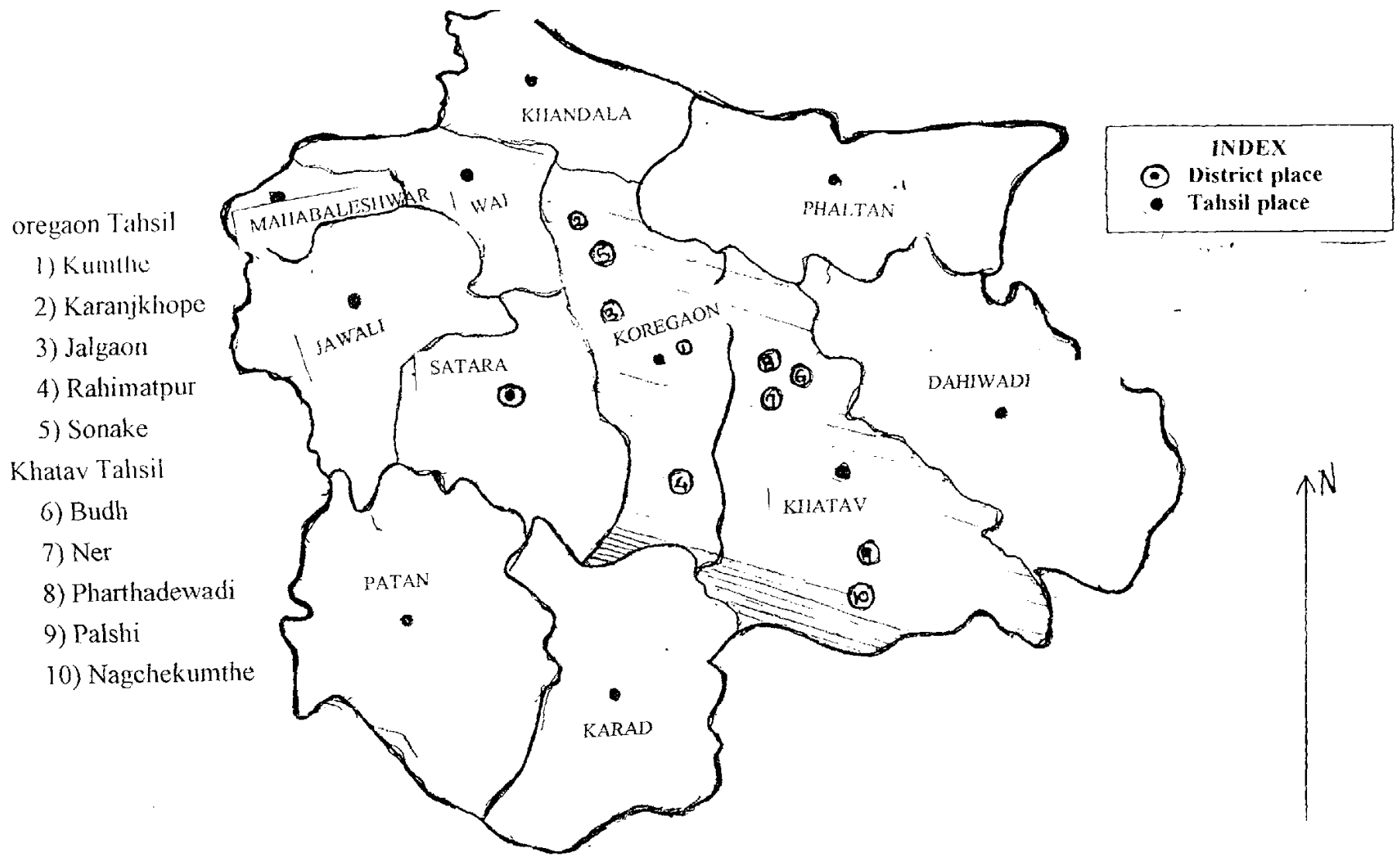


Fig. 3.1 Location map of Sample Villages selected for the study Area
(Satara District)

4.3 Climate and rainfall

The climate of Satara district is characterised by dry and hot climate during summer season in plains while cool climate in hilly areas. During winter, climate is generally cool in plains and temperature is very low in hilly areas. Three seasons; rainy season starts from middle of June last up to September. Winter season, from October to February and summer season from March to May.

As per geographical situation, there are differences in the intensity of rainfall in various parts of the district. Yearly average rainfall is as low as 462 mm in drought prone tahsil of Man in the eastern side and it is as high as 6182 mm in Western part of Mahabaleshwar which is the highest in the state. To the Western side, it ranges from 500 mm in between Western part and 1200 to 2000 mm in the eastern part which comprises the tahsils of Patan and Jawali. The central and southern part of district which comprises of Satara, Wai, Koregaon and Karad tahsils, receive rainfall to the extent of 600 to 1200 mm. The eastern side tahsils of Phaltan, Man and Khatav and northern side tahsil Khandala fall in the belt of low rainfall area.

4.4. Soils

The Western side of district, which comprises of Mahabaleshwar, Jawali, Wai and Patan tahsils, soil is formed from laterite rocks. Soils in the basins of Krishna, Venna and Koyna, rivers from Wai, Jawali and Patan tahsils are deep and fertile soils. Soils from Khandala, Man, Khatav tahsils are rocky and less fertile. Khatav, Man and Khandala are scarcity prone tahsils.

4.5. Land utilization pattern

4.5.1 Land utilization pattern of Satara district

Table 4.1 Land utilization pattern of Satara district (1999-2000)

Sr. No.	Land use category	Area in "00" hectares	Percentage to total area
1	Total geographical area	10580	100.00
2	Forest	1420	13.43
3	Barren and uncultivable land	1220	11.53
4	Land put to nonagricultural use	1200	11.34
5	Permanent pasture and other grazing land	990	9.35
6	Net sown area	5750	54.35
7	Double cropped area	970	
8	Gross cropped area	6720	
9	Cropping intensity (%)	116.87	-

Source : Socio- Economic Review and District Statistical Abstract of Satara District .(1999-2000)

It is seen from the table 4.1 that total geographical area of Satara district is 1058000 hectares. Out of total geographical area share of net sown area was to the extent of 54.35 per cent. Next to the cropped area, the major land use were consisting of forest land 13.43 per cent, land put to nonagricultural use 11.34 per cent and permanent pastures and other grazing land 9.35 per cent. Only 97000 hectares of the area was sown more than once and intensity of cropping was found to be 116.87 per cent.

4.5.2 Land utilization pattern of Khatav and Koregaon tahsils.

Table 4.2 Land utilization pattern of Khatav and Koregaon tahsils. (1999-2000)

Sr. No.	Land use category	Area in "00" hectares	
		Khatav	Koregaon
1	Total geographical area	1365 (100.00)	948 (100.00)
2	Forest	61 (4.47)	104 (10.97)
3	Barren and uncultivable land	213 (15.97)	88 (9.28)
4	Land put to nonagricultural use	78 (5.71)	40 (4.22)
5	Permanent pasture and other grazing land	235 (17.22)	110 (11.61)
6	Net sown area	773 (56.63)	606 (63.92)
7	Double cropped area	232	121
8	Gross cropped area	1005	727
9	Cropping intensity	130.0	119.97

(Figures in parentheses are the percentages to the total)

Source : Socio- Economic Review and District Statistical Abstract of Satara District (1999-2000)

It can be reviewed from Table 4.2., the total area was 136500 and 94800 hectares incase of Khatav and Koregaion. Proportion of net area sown to the total area was found to be 56.63 per cent and 63.92 per cent in case of Khatav and Koregaon tahsils. Only 23200 and 12100 hectares of the area were sown more than once in Khatav and Koregaon tahsil, respectively.

4.6 Cropping pattern

The area under different crops in Satara district during 1999-2000 is presented in Table 4.3.

Table 4.3. Area under different crops in Satara District

(1999-2000)			
Sr. No.	Crop	Area in '00' ha.	Percentage to total cropped area
1	Jowar	2026.02	30.14
2	Bajra	1119.17	16.66
3	Rice	419.22	6.23
4	Wheat	380.80	5.67
5	Other Cereals	68.24	1.02
I	Total Cereals	4013.45	59.72
6	Tur	248.30	3.69
7	Mung	109.23	1.63
8	Other Pulses	507.74	7.56
II	Total pulses	865.27	12.88
III	Total food grains (I+II)	4878.72	72.6
9	Sugarcane	525.94	7.82
10	Fruit crops	60.75	0.80
11	Vegetables	169.87	2.62
IV	Total food crops (9+10+11+III)	5635.28	83.84
V	Total nonfoods	1084.72	16.16
VI	Total cropped area (IV + V)	6720.00	100.00

Source : Socio- Economic Review and District Statistical Abstract of Satara District (1999-2000)

It is seen from the Table 4.3 that, of the total cropped area, maximum area (83.92 per cent) was under total food crops, wherein cereal crops alone occupied 59.72 per cent area in the total cropped area. This was followed by pulses which shared 12.88 per cent of the total cropped area. Fruits and vegetables occupied to the total cropped area about 0.82 and 2.62 per cent, respectively.

Table 4.4 Area under different crops in Khatav and Koregaon tahsils.

(1999-2000)

Sr. No.	Crop	Area in '00' ha.	
		Khatav	Koregaon
1	Jowar	322.68 (32.10)	304.78 (41.92)
2	Bajra	214.03 (21.29)	65.36 (8.99)
3	Rice	2.02 (0.20)	6.00 (0.82)
4	Wheat	25.91 (2.57)	25.67 (3.53)
5	Other Cereals	1.04 (0.10)	0.01 (0.013)
I	Total Cereals	565.68 (56.28)	401.82 (55.27)
6	Tur	90.10 (8.96)	82.40 (11.33)
7	Mung	30.01 (2.98)	22.00 (3.06)
8	Other Pulses	84.05 (8.36)	70.27 (9.66)
II	Total pulses	204.16 (20.32)	174.67 (24.03)
III	Total food grains (I+II)	769.84 (76.60)	576.49 (79.30)
9	Sugarcane	9.70 (0.96)	59.50 (8.18)
10	Fruit crops	6.16 (0.62)	3.72 (0.51)
11	Vegetables	34.07 (3.39)	17.73 (2.44)
IV	Total food crops (9+10+11+III)	819.77 (81.57)	657.44 (90.43)
V	Total nonfoods	185.23 (18.43)	69.56 (9.57)
VI	Total cropped area (IV + V)	1005.00 (100.00)	727.00 (100.00)

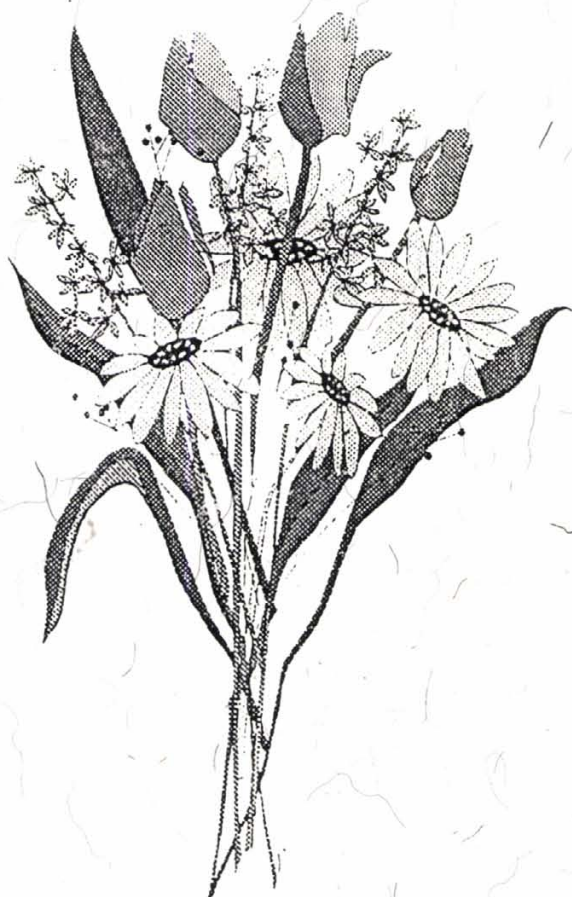
(Figures in parentheses are the percentages to the total)

Source : Socio- Economic Review and District Statistical Abstract of Satara District (1999-2000)

The total cropped area is 100500 ha. and 72700 hectares in Khatav and Koregaon tahsils, respectively. Total cereals contributed 56.28 and 55.27 per cent area to total cropped area in Khatav and Koregaon tahsils, respectively. Total pulses shared 20.32 and 24.03 per cent area of the total cropped in Khatav and Koregaon tahsil, respectively. The total food grains contributed 76.60 and 79.29 per cent area to the total cropped area in Khatav and Koregaon tahsil, respectively. The area under sugarcane was found more in Koregaon i.e. 8.18 per cent than area under sugarcane in Khatav (0.96%). The area under vegetables contributed about 3.39 and 2.44 per cent of the total cropped area in Khatav and Koregaon tahsils, respectively. The share of the area under total food crops and total nonfoods was 81.57 and 18.43 per cent to the total cropped area in Khatav tahsil while it was 90.43 per cent and 9.57 per cent in Koregaon tahsil.

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Chapter Opener Page



RESULTS AND DISCUSSION

5. RESULTS AND DISCUSSION.

This chapter deals with the presentation and interpretation of the results. Farmers behaviour in purchase of micronutrient fertilizers in Satara district has been examined in details. The various aspects such as the general information about sample farmers, present use pattern of micronutrients, factors influencing use behaviour, farmers opinion about the quality and cost of micronutrients etc. are examined. The results are presented and discussed in subsequent topics.

5.1 Socio-economic characteristics of the farmers.

5.1.1. Age.

Table 5.1 Distribution of respondents according to age.

Age	No. of respondents	Percent.
Young. (up to 35 years)	26	28.89
Middle (36 to 50 years)	44	48.89
Old (Above 51)	20	22.22
Total	90	100.00

It is apparent from the table 5.1 that, the age groupwise distribution of farmers upto 35 years, 36 to 50 years and 51 and above years at the overall level was 28.89, 48.89 and 22.22 per cent, respectively.

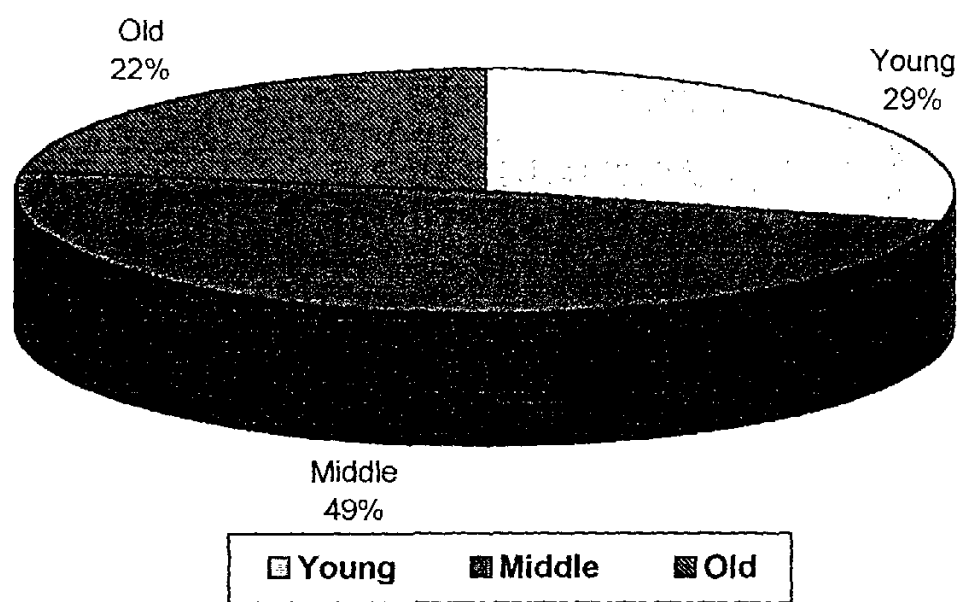


Fig. No. 5.1 Distribution of respondents according to age

Table. 5.2 Size groupwise association between age of farmers and use of micronutrient fertilizers.

Age	Size group of land holding			Overall
	Small (up to 1 ha.)	Medium (1.1 to 2.5 ha.)	Large (2.6 ha. & above)	
Young (up to 35 years)	9 (30.00)	12 (40.00)	5 (16.67)	26 (28.89)
Middle (36 to 50 years)	17 (56.67)	15 (50.00)	12 (40.00)	44 (48.89)
Old (Above 51 years)	4 (13.33)	3 (10.00)	13 (43.33)	20 (22.22)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

$$\chi^2_{\text{cal}} - 12.28$$

$$\text{Table value of } \chi^2 = 9.49$$

$$\text{Degree of freedom} = 4$$

Relationship is significant.

Age is the crucial factor in human behaviour. From the table 5.2 it is revealed that 30.00, 56.67 and 13.33 per cent of the young, middle and old age group of farmers showed adoption of micronutrient fertilizers from the small size of land holding group farmers, respectively.

It is revealed that 40.00, 50.00 and 10.00 per cent of the young, middle and old age group of farmers showed adoption of micronutrient fertilizers from the medium size of land holding group farmers, respectively.

It is revealed that 16.67, 40.00 and 43.33 per cent of the young, middle and old age group of farmers showed adoption of micronutrient fertilizers from the large size of land holding group farmers, respectively.

At the overall level, it is seen that 48.89 per cent farmers from middle groups showed higher adoption than young and old group of farmers.

The relationship between age and adoption of micronutrient fertilizers was found to be statistically significant.

5.1.2. Education

Table 5.3. Distribution of respondents according to education.

Education	No. of respondents	Per cent
Illiterate (No. education)	8	8.89
Primary (up to 7 th std)	14	15.56
Secondary (8 th to 10 th std.)	19	21.11
Higher secondary (11 th to 12 th std.)	19	21.11
College	30	33.33
Total	90	100.00

It can be seen from the table 5.3 that, the percentage of illiterate and literate farmers to the total were 8.89 and 91.11 per cent, respectively. Among the literate category, the primary, secondary, higher secondary and collegiate education comprises of 15.56, 21.11, 21.11 and 33.33 per cent, respectively.

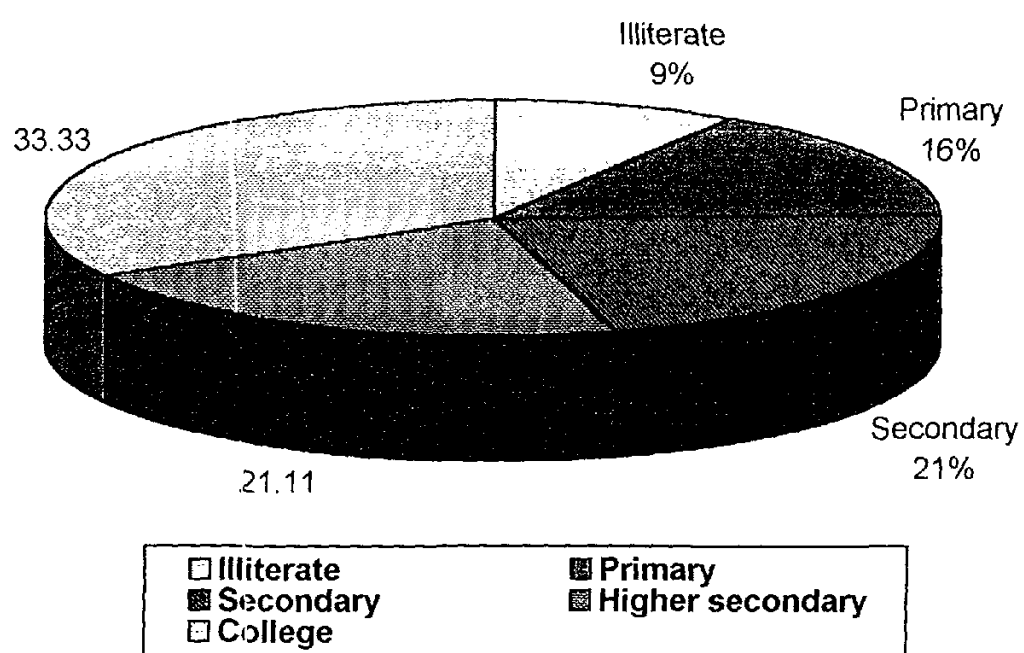


Fig. No. 5.2 Distribution of respondents according to education

Total 5.4. Size group wise association between education of farmers and use of micronutrient fertilizers.

Education	Size group of land holding			Overall
	Small (up to 1 ha.)	Medium (1.1 to 2.5 ha.)	Large (2.6 ha. & above)	
Illiterate (No education)	5 (16.67)	3 (10.00)	0	8 (8.89)
Primary (Up to 7 th Std.)	12 (40.00)	2 (6.67)	0	14 (15.56)
Secondary (8 th to 10 th Std.)	3 (10.00)	6 (20.00)	10 (33.33)	19 (21.11)
Higher Secondary (11 th to 12 th Std.)	5 (16.67)	9 (30.00)	5 (16.67)	19 (21.11)
College (13 th Std & above)	5 (16.66)	10 (33.33)	15 ✓ (50.00)	30 (33.33)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

$\chi^2_{cal} = 33.34$

Table value of $\chi^2 = 15.51$

Degrees of freedom = 8

Relationship is significant

The level of formal education attained by an individual tends to influence the extent of adoption behaviour of a farmer. From the table 5.4, it is revealed that 16.67, 40.00, 10.00, 16.67 and 16.66 per cent of the illiterate primary, secondary, higher secondary and college level group of farmers showed adoption of micronutrient fertilizers from the small size of land holding farmers, respectively.

It is revealed that 10.00, 6.67, 20.00, 30.00 and 33.33 per cent of the illiterate primary, secondary, higher secondary and college level group of farmers showed adoption of micronutrient fertilizers from the medium size of land holding farmers, respectively.

It is revealed that 33.33, 16.67 and 50.00 per cent of the secondary, higher secondary and college level group of farmers showed adoption of micronutrient fertilizers from the large size of land holding farmers, respectively.

At the overall level, it is seen that secondary, higher secondary and college level educated farmers having higher adoption of micronutrient fertilizers than illiterate farmers. The relationship between education and adoption of micronutrient fertilizers was found to be statistically significant.

5.1.3. Size of family

Table 5.5. Distribution of respondents according to size of family.

Size of family	No. of respondents	Percent.
Small (up to 5 member)	19	21.11
Medium (6 to 7 member)	42	46.67
Large (Above 7 member)	29	32.22
Total	90	100.00

It is apparent from the table 5.5 that, the size of family groupwise distribution of users small, medium and large size of family at the overall level was 21.11, 46.67 and 32.22 per cent, respectively.

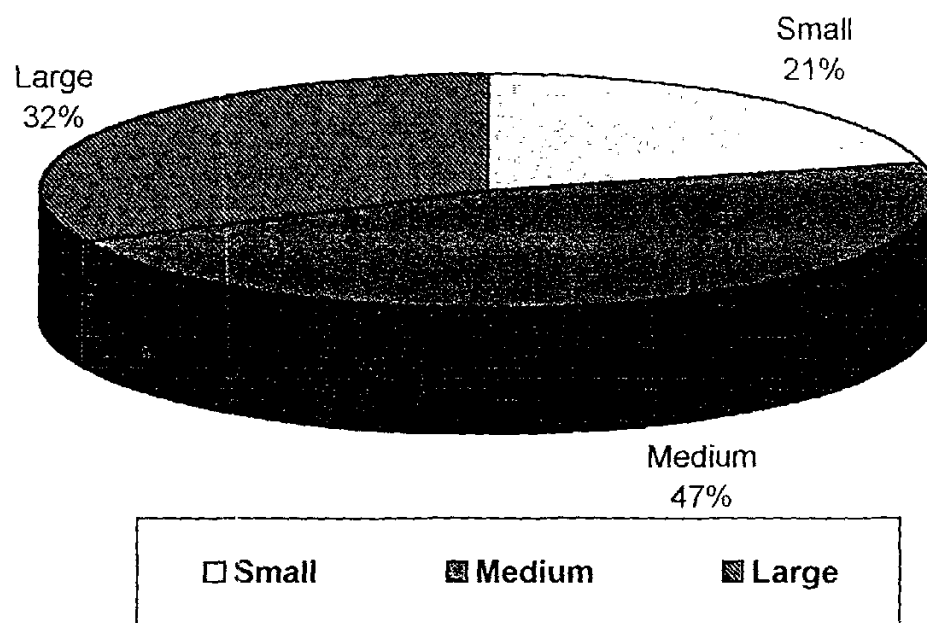


Fig. No. 5.3 Distribution of respondents according to size of family

Table 5.6. Size groupwise association between size of family of farmers and use of micronutrient fertilizers.

Size of family	Size of land holding			Overall
	Small (up to 1 ha)	Medium (1.1 to 2.5 ha)	Large (Above 2.5 ha)	
Small (up to 4 member)	8 (26.67)	6 (20.00)	5 (16.67)	19 (21.11)
Medium (5 to 6 member)	16 (53.33)	14 (46.67)	12 (40.00)	42 (46.67)
Large (Above 6 member)	6 (20.00)	10 (33.33)	13 (43.33)	29 (32.22)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

$$\chi^2_{\text{cal}} = 3.84$$

$$\text{Table value of } \chi^2 = 9.49$$

$$\text{Degrees of freedom} = 4$$

Relationship is insignificant

In the social structure of Indian village communities, the family occupies the most important place. It is an important unit of social, economical and cultural institution. As such, it is important to study the size of family and adoption behaviour. From the Table 5.6 it is revealed that, 26.67, 53.33 and 20.00 per cent of the small, medium and large size of family group of farmers showed adoption of micronutrient fertilizers from the small size of land holding farmers, respectively.

It is revealed that, 20.00, 46.67 and 33.33 per cent of the small, medium and large size of family group of farmers showed adoption of micronutrient fertilizers from the medium size of land holding farmers, respectively.

It is revealed that, 16.67, 40.00 and 43.33 per cent of the small, medium and large size of family group of farmers showed adoption of micronutrient fertilizers from the large size of land holding farmers, respectively.

At the overall level maximum adoption of micronutrient fertilizer is found in medium size of family than small and large size of family farmers. The relationship between size of family and adoption of micronutrient fertilizers was found to be statistically insignificant.

5.1.4. Social participation

Table 5.7. Distribution of respondents according to social participation

Social participation	No. of respondents	Per cent
No	11	12.22
Low	23	25.56
Medium	27	30.00
High	29	32.22
Total	90	100.00

It is apparent from the table 5.7 that the social participation groupwise distribution of users as no participation, low participation, medium participation and high participation was 12.22, 25.56, 30.00 and 32.22 per cent, respectively.

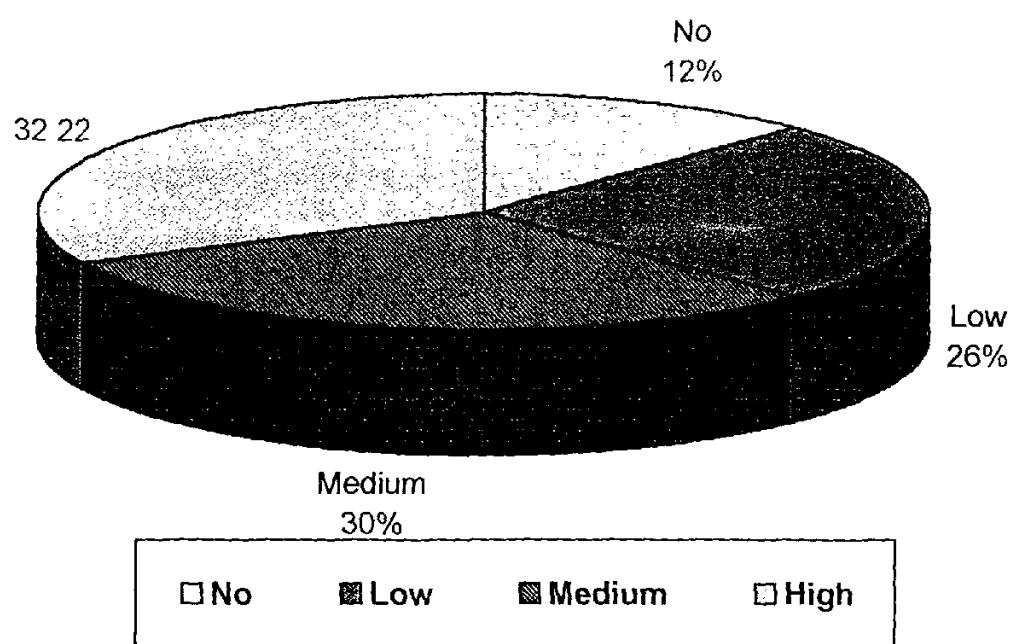


Fig. No. 5.4 Distribution of respondents according to social participation

Table 5.8 Size groupwise association between Social participation of farmers and use of micronutrient fertilizers.

Social participation	Size of land holding			Overall
	Small (up to 1 ha)	Medium (1.1 to 2.5 ha)	Large (Above 2.5 ha)	
No	7 (23.33)	4 (13.34)	0	11 (12.22)
Low	14 (46.67)	8 (26.66)	1 (3.33)	2 (25.56)
Medium	6 (20.00)	6 (20.00)	15 (50.00)	27 (30.00)
High	3 (10.00)	12 (40.00)	14 (46.67)	29 (32.22)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

χ^2 cal - 24.93

Table value of $\chi^2 = 12.59$

degrees of freedom = 6

Relationship is significant

Social participation is the crucial factor in human behaviour. From the table 5.8 it is revealed that 23.33, 46.67, 20.00 and 10.00 per cent of the no, low, medium and high social participated group of farmers showed adoption of micronutrient fertilizers from the small size of land holding groups, respectively.

It is revealed that 13.34, 26.66, 20.00 and 40.00 per cent of the no, low, medium and high social participated group of farmers showed adoption of micronutrient fertilizers from the medium size of land holding groups, respectively.

It is revealed that 3.33, 50.00 and 46.67 per cent of the low, medium and high social participated group of farmers showed adoption of micronutrient fertilizers from the large size of land holding groups, respectively.

At the overall level 32.22 per cent high socially participated farmers adoption of micronutrient is higher than low social participated i.e. 25.56 per cent farmers. The relationship between social participation and adoption of micronutrient fertilizers was found to be statistically significant.

5.1.5. Size of Land holding

Table 5.9. Distribution of respondents according to size of land holding.

Size of land holding	No. of respondents	Percent.
Small (up to 1 ha)	30	33.34
Medium (1.1 to 2.5 ha)	30	33.33
Large (Above 2.6 ha.)	30	33.33
Total	90	100.00

It is apparent from the table 5.9 that, the size of land holding groupwise distribution of users up to 1 ha, 1.1 to 2.5 ha and Above 2-6 ha at the overall level 30 farmers each of the group.

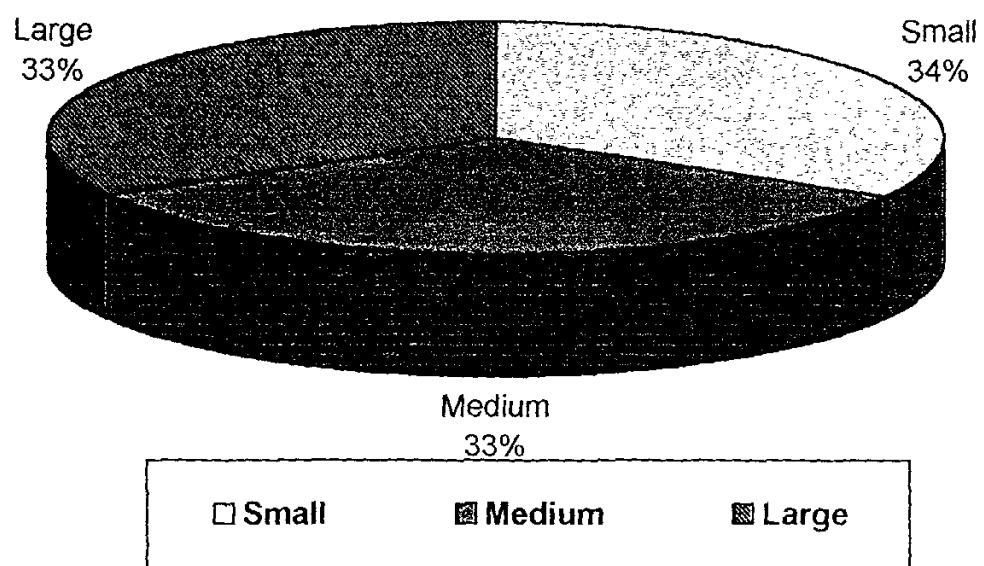


Fig. No. 5.5 Distribution of respondents according to size of land holding

Table 5. 10 Size groupwise association between size of holding of farmers and use of micronutrient fertilizers.

Expenditure on micronutrient fertilizers	Size of land holdings			Overall
	Small (up to 1 ha)	Medium (1.1 to 2.5 ha)	Large (Above 2.5 ha)	
Low (Below Rs. 500)	13 (43.33)	10 (33.33)	7 (23.33)	30 (33.33)
Medium (Rs. 501 to 1000)	12 (40.00)	12 (40.00)	9 (30.00)	33 (36.67)
High (Above Rs. 1000)	5 (16.67)	8 (26.67)	14 (46.67)	27 (30.00)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

$$\chi^2_{\text{cal}} = 7.8$$

$$\text{Table value of } \chi^2 = 9.46$$

$$\text{degrees of freedom} = 4$$

Relationship is insignificant

The size of land holding is an important factor determining the adoption behaviour of a farmer. From the table 5.10 it is revealed that, 43.33 40.00 and 16.67 per cent of the low, medium and high expenditure of farmer showed adoption of micronutrient fertilizers from the small size of land holding farmers, respectively.

It is revealed that, 33.33, 40.00 and 26.67 per cent of the low, medium and high expenditure of farmer showed adoption of micronutrient fertilizers from the medium size of land holding farmers, respectively.

It is revealed that, 23.33, 30.00 and 46.67 per cent of the low, medium and high expenditure of farmer showed adoption of micronutrient fertilizers from the large size of land holding farmers, respectively.

At the overall level, it is seen that 36.67 per cent medium expenditure is done followed by low expenditure and high expenditure 33.33 and 30.00 per cent, respectively.

The relationship between size of land holding and adoption of micronutrient fertilizers is statistically insignificant.

5.1.6. Annual income

Table 5.11 Distribution of respondents according to annual income.

Annual income	No. of respondents	Percent.
Small (up to Rs. 50,000)	26	28.89
Medium (Rs. 50,000 to Rs.1,50,000)	27	30.00
Large (Above Rs. 1,50,000)	37	41.11
Total	90	100.00

It is apparent from the table 5.11 that, the annual income groupwise distribution of users as low, medium and high income groups at the overall level was 28.89, 30.00 and 41.11 per cent, respectively.

Table 5.12 Size groupwise association between annual income of farmers and use of micronutrient fertilizers.

Annual Income	Size of land holding			Overall
	Small (up to 1 ha)	Medium (1.1 to 2.5 ha)	Large (Above 2.5 ha)	
Low income (up to 50,000)	18 (60.00)	8 (26.67)	0	26 (28.89)
Medium income (50,000 to 1,50,000)	9 (30.00)	8 (26.67)	10 (33.33)	27 (30.00)
Large income (Above 1,50,000)	3 (10.00)	14 (46.66)	20 (66.67)	37 (41.11)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

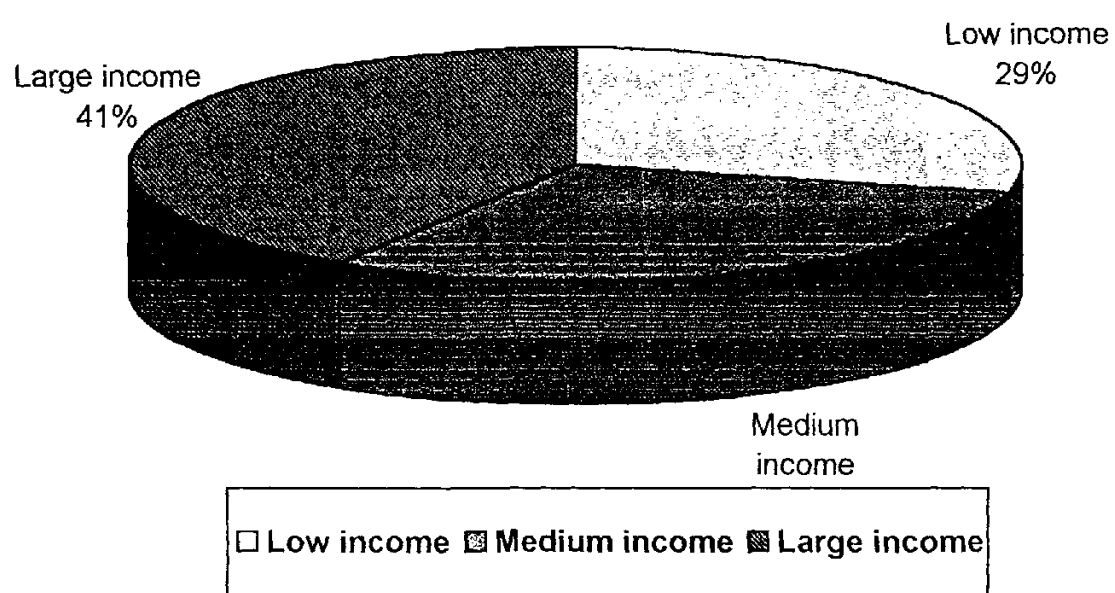


Fig. No. 5.6 Distribution of respondents according to annual income

$$\chi^2_{\text{cal}} = 22.33$$

Table value of $\chi^2 = 9.49$

Degrees of freedom = 4

Relationship is significant

Annual income is a key factor in all occupations. Income influence the farming to a great extent. Agriculture requires sound economic background can afford to invest money in agriculture without much difficulty.

From the table 5.12 it is revealed that 60.00 and 26.67 per cent of low income group showed adoption of micronutrient fertilizers from the small and medium size of land holding farmers, respectively.

It is revealed that, 30.00, 26.67 and 33.33 per cent of medium income group farmers showed adoption of micronutrient fertilizers from the small, medium and large size of land holding farmers, respectively.

It is revealed that 10.00, 46.66 and 66.67 per cent of large income group farmers showed adoption of micronutrient fertilizers from the small, medium and large size of land holding farmers respectively.

Minimum i.e. 28.89 per cent of low income group farmers adoption on micronutrient followed by medium income group i.e. 30.00 per cent while high adoption was observed in large group income i.e. 41.11 per cent this clearly indicates relationship.

The relationship between annual income and adoption of micronutrient fertilizer was found to be statistically significant.

5.1.7 Occupation

Table 5.13 Distribution of respondents according to occupation.

Occupation	No. of respondents	Percent.
Farming	60	66.66
Farming + Service	27	30.00
Farming + Business	3	3.34
Total	90	100.00

It can be seen from the table 5.13 that the farming, farming + service and farming + business comprises of 66.66, 30.00 and 3.34 per cent, respectively.

Table 5.14 Size groupwise association between occupation of farmers and use of micronutrient fertilizers.

Occupation	Size of land holding			Overall
	Small (up to 1 ha)	Medium (1.1 to 2.5 ha)	Large (Above 2.5 ha)	
Farming	22 (73.33)	18 (60.00)	20 (66.67)	60 (66.66)
Farming + service	7 (23.33)	10 (33.33)	10 (33.33)	27 (30.00)
Farming + business	1 (3.34)	2 (6.67)	0	3 (3.34)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

$$\chi^2_{\text{cal}} = 3.07$$

$$\text{Table value of } \chi^2 = 9.49$$

Degrees of freedom = 4

Relationship is insignificant

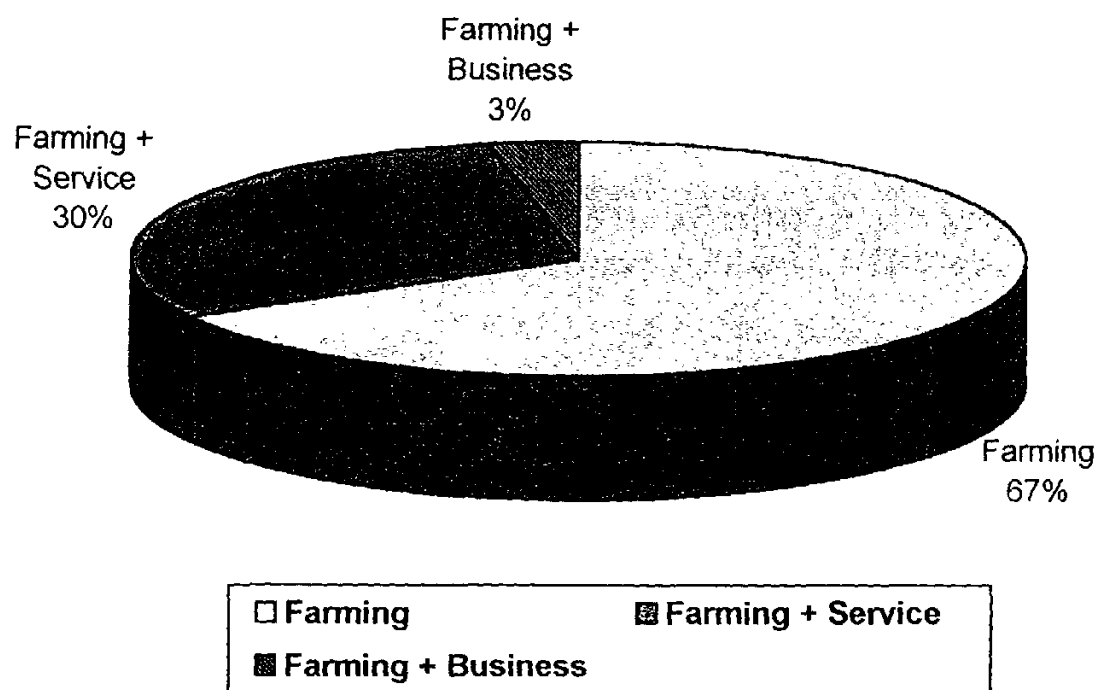


Fig. No. 5.7 Distribution of respondents according to occupation

From the table 5.14 it is revealed that 73.33, 23.33 and 3.34 per cent of the farming, farming + service and farming + business occupation group of farmers showed adoption of micronutrient fertilizer from the small size of land holding farmers, respectively.

It is revealed that 60.00, 33.33 and 6.67 per cent of the farming, farming + service and farming + business occupation group of farmers showed adoption of micronutrient fertilizer from the medium size of land holding farmers, respectively.

It is revealed that 66.67, and 23.33 per cent of the farming and farming + service occupation group of farmers showed adoption of micronutrient fertilizer from the large size of land holding farmers, respectively.

At the overall level it is seen that 66.66 per cent farmers from farming group showed higher adoption than farming + service and farming + business group of farmers

The relationship between occupation and adoption of micronutrient fertilizer was found to be statistically insignificant.

5.1.8 Capital assets

The details regarding to the investment in the capital assets by the farmers are given as below.

5.1.8.1. Land holding

The details regarding the size groupwise average size of land holdings possessed by the farmers are presented in Table 5.15

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Table 5.15 Average size of land holdings of the selected farmers.

Sr. No.	Particulars	Size group of holdings (ha)			Overall
		I	II	III	
1	Total land holding	0.87 (100.00)	2.43 (100.00)	4.70 (100.00)	2.66 (100.00)
2	Waste land/ uncultivated land	0.06 (6.89)	0.17 (7.00)	0.53 (11.27)	0.25 (9.52)
3	Cultivated land	0.81 (93.10)	2.26 (93.00)	4.17 (88.73)	2.41 (90.48)
a	Unirrigated	0.32 (36.78)	0.83 (34.16)	1.30 (27.67)	0.81 (30.41)
b	Irrigated	0.49 (56.32)	1.43 (58.84)	2.87 (61.06)	1.60 (60.07)

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

It can be seen from the table 5.15 that at the overall level farmers had an average land holding of 2.66 hectares. The percentages of waste and cultivated land to total land holding at the overall level, were 9.52 and 90.48 per cent, respectively. The percentage of irrigated and unirrigated land to the total land holding at the overall level was 60.07 and 30.41 per cent, respectively.

Further it can be seen from the table 5.15 that the average land holding possessed by small, medium and large groups of farmers was 0.87, 2.43 and 4.70 hectares, respectively. Out of total land holdings possessed by the farmers, the proportion of wasteland was the highest in large size group (11.27 per cent), followed by medium (7.00 per cent) and small size group (6.89 per cent). The proportion of cultivated land to the total land holding was highest in small size group (93.10 per cent) followed by medium (93.00 per cent) and large size group of holding (88.73 per cent). The proportion of unirrigated land to the total

land holding was the highest in small size group (36.78 per cent), followed by medium (34.16 per cent) and large size group of holdings (27.67 per cent).

The proportion of irrigated land to the total cultivated land was found highest in large size group (61.06 per cent), medium (58.84 per cent) and small size group of holding (56.32 per cent). It is concluded from the Table that waste, cultivated and unirrigated land showed an increasing trend as size of holding increased in absolute terms.

5.1.8.2. Buildings

The details about the investment made in different types of buildings by the farmers are presented in Table 5.16.

Table 5.16 Average per farm investment made in different types of buildings by the farmers.

Sr. No.	Particulars Buildings.	Size group of holdings (ha)			Overall
		Small	Medium	Large	
1	Pucca	1,43,000 (85.10)	1,87,000 (82.53)	2,35,000 (81.70)	18,833.33 (82.80)
2	Kaccha	25,026.66 (14.90)	35,039.00 (15.46)	36,849.00 (12.80)	32,304.66 (14.20)
3	Byre	--	4,530.00 (2.01)	15,850.00 (5.50)	6,793.3 (3.00)
	Total	1,68,026.66 (100.00)	2,26,569 (100.00)	2,87,699 (100.00)	2,27,431.32 (100.00)

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

It is apparent from the table 5.16 that, at the overall level the per farm investment made in buildings was Rs. 227321.32 of which the proportion of

pucca, kaccha residential buildings and byre were 82.80, 14.20 and 3.00 per cent, respectively.

Among the size groups it is seen that only medium and large farmers have possessed the byre. Further it is observed that the percentage share on investment in pucca residential buildings showed an decreasing trend as size of holding increased, while investment in kaccha residential buildings showed no specific trend.

5.1.8.3. Implements and Machinery

The information on size groupwise and itemwise per farm investment made by farmers in implements and machinery is presented in Table 5.17

Table 5.17 Per farm size groupwise investment made in farm implements and machinery.

Sr. No.	Particulars	Size groups of holdings						Overall	
		Small		Medium		Large			
		Avg. number	Perfarm investment Rs.	Avg. number	Perfarm investment Rs.	Avg. number	Perfarm investment Rs.	Avg. number	Perfarm investment Rs.
A	<u>Farm implements</u>								
I	Bullock cart	0.4	202.66 (10.11)	0.5	2416.66 (5.97)	0.8	2314.66 (3.45)	0.56	1644.66 (3.92)
II	Seed drill	0.13	91.66 (0.45)	0.16	116.66 (0.28)	0.20	140.00 (0.20)	0.16	116.10 (0.28)
B	<u>Farm Machinery</u>								
I	Oil engine	--	--	0.03	100.00 (0.24)	--	--	0.01	33.33 (0.08)
II	Electric Motor	0.23	1750.00 (8.73)	0.80	2626.68 (6.69)	0.90	2683. (4.00)	0.64	2353.33 (5.62)
III	Tractor	0.06	14000.00 (69.87)	0.13	32232.30 (79.73)	0.20	58333.33 (87.14)	0.13	34855.21 (83.28)
IV	Pipe line	0.23	2166.66 (10.84)	0.33	2933.00 (7.29)	0.30	3466.00 (5.17)	0.28	2855.22 (6.82)
	Total	-	20034.98 (100.00)	--	40425.30 (100.00)	--	66937.32 (100.00)	--	41857.85 (100.00)

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

It can be seen from table 5.17 that at the overall level, investment in farm implements and machinery was to the extent Rs. 41,857.85.

The proportion of investment made in implement and machinery to the total investment at the overall level was to the extent of 4.20 per cent and 95.80 per cent, respectively.

Among the size groups, it is seen that same trend was followed for investment in farm implements and machinery but their proportion differ. It is concluded that, at the overall level major items of investment in the farm implements and machinery were bullock cart and tractor, respectively. Among the size group, it is concluded that, the investment in farm implements showed an decreasing trend, while investment in farm machinery especially tractor showed an increasing trend as the size groups of holdings increased.

5.1.9 Land use pattern

The details regarding the size groupwise land use pattern of the farmers are presented in Table 5.18.

It is seen from the table 5.18 the total land holding possessed by the users was 2.66 hectares. Out of the total land possessed by the farmers, the percentage of uncultivated land was to the extent of 9.52 per cent. The proportion of net cultivated land to the total land holding was 90.48 per cent. The proportion of cultivated land to the total land holding was 93.10, 93.00 and 88.72 per cent in small, medium and large size groups, respectively. The gross cropped area at the over-all level was 1.74, 4.00 and 7.16 hectares in small, medium and large size groups, respectively. The intensity of cropping at overall level was 178.46 per cent, while GCA was 4.29 hectares.

Table 5.18 Average land use pattern.

Sr. No.	Particulars	Size of group holdings			Overall
		I	II	III	
1	Total land holdings	0.87 (100.00)	2.43 (100.00)	4.70 (100.00)	2.66 (100.00)
2	Waste land/ uncultivated land	0.06 (6.90)	0.17 (7.00)	0.53 (11.28)	0.25 (9.52)
3	Cultivated area	0.81 (93.10)	2.26 (93.00)	4.17 (88.72)	2.41 (90.48)
4	Cropped area				
i	Kharif	0.81 (100.00)	1.80 (79.64)	3.19 (76.49)	1.93 (80.08)
ii	Rabi	0.81 (100.00)	1.46 (64.60)	2.28 (54.67)	1.51 (62.65)
iii	Summer	0.12 (14.81)	0.23 (11.50)	0.88 (21.10)	0.42 (17.42)
iv	Annual	-	0.48 (21.23)	0.81 (19.42)	0.43 (17.84)
5	Gross cropped area	1.74	4.00	7.16	4.29
6	Cropping Intensity (%)	214.8	176.99	171.70	178.00

(Figures in the parentheses are the percentages to the net cultivated area)

5.1.10 Cropping pattern

Cropping pattern is another important vital actor influencing the level of expenses on farm inputs and the returns from the farm business. Table 5.19 presents the information an area under different crops.

It is seen from the table 5.19 that, at the overall level amongst the kharif crops, the area under potato was highest (16.08 per cent), followed by french bean (12.58 per cent), pulses (5.36 per cent), jowar (3.49 per cent). In case the Rabi crops at the overall level, it is seen that the area under jowar was highest (12.12 per cent), followed by onion (10.95 per cent), wheat (6.06 per cent), Gram (4.42 per cent) and maize (1.63 per cent).

Table 5.19 Cropping pattern of selected farmers

Sr. No.	Particulars	Size groups of holdings			Overall
		Small	Medium	Large	
	<u>Kharif</u>				
1.	French Bean	0.20 (11.49)	0.40 (10.00)	1.02 (14.24)	0.54 (12.58)
2	Pulses	0.15 (8.62)	0.16 (4.00)	0.40 (5.58)	0.23 (5.36)
3	Potato	0.23 (13.21)	0.64 (16.00)	1.20 (2.79)	0.69 (16.08)
4	Bajara	0.13 (7.47)	0.40 (10.00)	0.42 (5.86)	0.32 (4.45)
5	Jawar	0.10 (5.74)	0.20 (5.00)	0.15 (2.09)	0.15 (3.49)
	Total	0.81 (46.55)	1.80 (45.00)	3.19 (44.55)	1.93 (44.99)
	<u>Rabi</u>				
1	Onion	0.25 (14.36)	0.43 (10.75)	0.73 (10.19)	0.47 (10.95)
2	Gram	0.10 (5.74)	0.10 (2.5)	0.37 (5.16)	0.19 (4.42)
3	Wheat	0 (0)	0.30 (7.5)	0.50 (6.98)	0.26 (6.06)
4	Maize	0.05 (2.87)	0.06 (1.5)	0.10 (1.9)	0.07 (1.63)
5	Jawar	0.41 (23.56)	0.57 (14.25)	0.58 (8.10)	0.52 (12.12)
	Total	0.81 (46.56)	1.46 (36.50)	2.28 (31.84)	1.51 (35.19)
	<u>Summer</u>				
1	Groundnut	0.12 (6.89)	0.11 (2.75)	0.47 (6.56)	0.23 (5.36)
2	Tomato	0 (0)	0.13 (3.25)	0.29 (4.05)	0.14 (3.26)
3	Chilli	0 (0)	0.02 (0.5)	0.12 (1.67)	0.0466 (1.08)
	Total	0.12 (6.89)	0.26 (6.5)	0.88 (12.29)	0.42 (9.89)
	<u>Annual</u>				
	Sugarcane	0 (0)	0.39 (9.75)	0.64 (8.93)	0.34 (7.92)
	Ginger	0 (0)	0.09 (2.25)	0.17 (2.37)	0.0863 (2.01)
	Total	0 (0)	0.48 (12.00)	0.81 (11.31)	0.43 (9.93)
	Gross Cropped area	1.74 (100.00)	4.00 (100.00)	7.16 (100.00)	4.29 (100.00)

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

In the case of summer crops, the area under groundnut was highest (5.36 per cent), followed by tomato (3.26 per cent) and chilli (1.08 per cent). The area under annual crop especially sugarcane and ginger was 7.92 and 2.01 per cent, respectively. Among the size groups of holdings it is seen that the vegetables like potato, onion and tomato cultivating areas are higher than other crops i.e. 16.08, 10.95 and 3.26 per cent, respectively. So that these vegetable crops are purposively selected for studies.

5.1.11 Distribution of Respondents according to Brand Preference

Table 5.20 Distribution of Respondents according to Brand preference

Brand preference	Size group of land holdings			Total
	Small (Upto 1 ha)	Medium (1.1 ha to 2.5 ha)	Large (Above 2.6 ha)	
RanadeyMicronutrients	16 (53.33)	17 (56.67)	20 (66.66)	53 (58.89)
Deepak fertilizer & petrochemical Ltd.	8 (26.67)	7 (23.33)	6 (20.00)	21 (23.34)
Rallies India Ltd.	6 (20.00)	4 (13.33)	2 (6.67)	12 (13.33)
Karnataka Agro. Ltd.	-	2	2	4
(Multiples)	-	(6.67)	(6.67)	(4.44)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

From table 5.20 it is revealed that 53.33, 56.67 and 66.66 per cent sample farmers from the small, medium and large groups showed use of Ranadey micronutrient fertilizers, respectively.

Table 5.20 shows at the overall level 58.89 percent respondents preferred Ranadey micronutrients, followed by Deepak Petrochemicals (23.34 per cent), Rallies India Ltd. (13.33 per cent) and Karnataka Agro Ltd. multiples (4.44 percent).

It is seen that small, medium and large farmers from study area shows more use of Ranadey micronutrient than any other companies product of micronutrient.

5.1.12 Source of information

Table 5.21 Distribution of respondents according to source of information.

Brand preference	Size group of land holdings			Total
	Small	Medium	Large	
Marketing representative of company	6 (0.00)	10 (22.00)	15 (31.91)	31 (27.67 %)
Krishi Seva Kendra	7 (35.00)	15 (33.3)	13 (27.65)	35 (31.25%)
Friends	1 (5.00)	8 (17.77)	10 (21.27)	19 (16.96%)
Neighbour	2 (10.00)	6 (13.33)	4 (8.51)	12 (10.71%)
Progressive farmer	4 (20.00)	6 (13.33)	5 (10.63)	15 (13.39%)
Total	20. (100.00)	45 (100.00)	47 (100.00)	*112 (100%)

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

(* Farmer may have more than one source of information.)

Table 5.21 shows that the source of information taken by farmers about the use of Ranadey micronutrients. For giving proper information to the farmers Krishi Seva Kendra and Marketing Representative have biggest role i.e. 31.25 per cent and 27.67 per cent, respectively.

Rest of the farmers got information from friends, progressive farmer(s) and neighbours as 16.96, 13.39 and 10.71 per cent, respectively

5.1.13 Mode of payment

Table 5.22 Distribution of respondents according to mode of payment.

Mode of payment	Size of group of land holdings			Total
	Small	Medium	Large	
Credit	10 (33.33)	8 (26.66)	9 (30.00)	27 (30.30)
Cash	20 (66.67)	22 (73.34)	21 (70.00)	63 (69.70)
Total	30 (100.00)	30 (100.00)	30 (100.00)	90 (100.00)

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

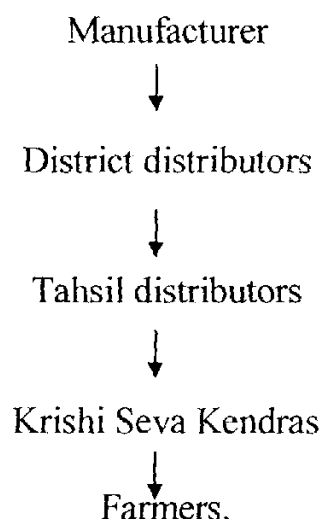
This section refers to the mode of payment adopted by the cultivators for the purchase of micronutrients fertilizers. The farmers generally purchase micronutrient fertilizers by cash because of small quantity use of micronutrient and not big amount of payment. eg. One acre of land 10 Kg. of boracol is required which costs only Rs. 320.

The information related with the mode of payment is depicted in table 5.22 shows that 69.70 per cent farmers purchase the micronutrient by cash and 30.30 per cent farmers purchase the micronutrient by credit.

5.2 Sales promotional strategies adopted by manufacturers.

Marketing management process identify customers needs, develop product and services to meet these needs, establishes, pricing policies and promotional programmes and implements a system of distribution to consumers.

5.2.1. Marketing channel of Ranadey Agro. Pvt. Ltd.



5.2.2 Mode of payment.

The Ranadey micronutrient company sales their product only by cash payment and not given any concession or discount pricing.

5.2.3 Availability of Ranadey micronutrient fertilizers.

The Ranadey Micronutrient is only available at Krishi Seva Kendra. They do not have any own separate shops for sale of their products.

5.2.4 Strategies adopted for sales promotion

Following sales promotional strategies were adopted by Ranadey micronutrient manufacturers.

1. Appointment of technical person as salesman at district and tahsil level distributors.
2. Information by technical person or staff on farm itself about the product.
3. Giving information of balanced nutrients of crops by the technical person.
4. One day training programmes are being arranged by the company the farmers.

5. Company provides pH meter instrument to technical staff which tests the soil and water pH and give exact information about the balanced nutrients.
6. Information regarding pH chart, 16 nutrient chart, deficiency chart, cell chart are made available to farmers through salesmen.
7. Seminars by technical persons at village level.

5.3 Effects of use of micronutrients on the productivity of vegetables.

In order to examine the relationship between dependent variable i.e. yield of vegetable crops with independent variable viz., Nitrogen, Phosphorous, Potash, Iron, Manganise, Zinc, Copper, Boron, Molybdenum and chlorine fertilizers multiple regression model was fitted to the sample data separately for their size group and at the overall level.

In Satara district vegetable viz; potato, onion and tomato are mostly grown and the micronutrient fertilizers also used by the sample farmers.

The results of the estimated production function is presented in table 5.16, 5.17 and 5.18 which gives the elasticities of production or regression coefficients, standard errors, their significance and coefficient of multiple determination.

5.3.1 Elasticities of production

The coefficient with respect to each particular input is the elasticity of production. These elasticities indicate the unit change in the total product associated with one per cent change in the concerned input factors.

5.3.1.1 Elasticity of potato production

From table 5.23 it is observed that in case of potato the elasticities of nitrogen fertilizer (X_1) variable was positive and significant at 1 per cent level for medium size group, indicates there is a scope to increase use of nitrogen fertilizer for this group. Where as, it was positive and non-significant for small and large size group holdings.

The elasticities of phosphorous fertilizers (X_2) variable was positive and significant at 1 per cent level for small and large size group indicates there is a scope for increase in use of phosphorous fertilizer for these two groups. Where as, it was positive and non-significant for medium size group holdings.

The elasticities of potash fertilizers (X_3) variable was positive and significant at 1 per cent level for small and 5 per cent level for large size groups indicates that there is scope to increase use of potash fertilizers for these groups. Where as it was positive and non significant for medium size group holding.

The elasticities of Iron (Fe) fertilizer (X_4) variable was positive and significant at 1 per cent level for medium size group indicates use of iron micronutrient having scope for this group. Where as it was positive and non significant for large size group holding and negative and non-significant for small size group holding.

The elasticity of manganese (Mn) micronutrient variable (X_5) was positive and significant at 1 per cent level for large size group indicates there is scope to use of manganese micronutrient. Where as it was positive and nonsignificant for small and medium size of group holding.

Table 5.23 Regression coefficient, standard errors and coefficient of multiple determination for potato on small, medium and large sized farms

Respondents	Small N=30	Medium N=30	Large N=30	Overall N=90
Constant (Intercept)	12.1814	37.5746	7.2316	16.8667
N (X ₁)	0.1418 (0.3100)	0.0517*** (0.0291)	0.1513 (0.1033)	0.0204** (0.0098)
P (X ₂)	0.07611*** (0.03872)	0.6475 (0.9680)	0.0219*** (0.0124)	0.0037*** (0.0021)
K (X ₃)	0.0808*** (0.0423)	0.0027 (0.002)	0.0516** (0.0194)	0.3487 (0.2972)
Fe (X ₄)	-3.3319 (0.6240)	0.7227*** (0.4074)	0.0048 (0.0049)	0.0806 (0.0913)
Mn (X ₅)	0.1131 (0.1870)	0.0014 (0.0067)	0.3037*** (0.1668)	0.0073 (0.0088)
Zn (X ₆)	-0.2580 (0.7250)	0.3949*** (0.2140)	-0.0143 (0.0248)	0.1163*** (0.0660)
Cu (X ₇)	0.02175*** (0.01125)	0.0119 (0.0116)	0.1600 (0.2037)	0.0166*** (0.0084)
B (X ₈)	0.0066*** (0.0083)	0.2162 (0.5136)	0.0061 (0.0070)	0.0092 (0.010)
Mo(X ₉)	-0.0136 (0.1410)	-0.0022 (0.0065)	-0.7237 (0.9986)	-0.1130 (0.0873)
R ²	0.8565	0.7582	0.6215	0.7454

(Figures in the parentheses are the standard errors of the respective regression coefficient)

- * Significance at 10 per cent level NS Non Significance
 ** Significance at 5 per cent level
 *** Significance at 1 per cent level

The elasticities of zinc (Zn) micronutrient (X_6) variable was positive and significant at 1 per cent level for medium size group indicates there is scope to use of Zinc micronutrient. Where as it was negative and nonsignificant for small and large size group of holding indicates no effect of productivity.

The elasticities of copper (Cu) micronutrient (X_7) variable was positive and significant at 1 per cent level for small size group indicates there is scope to use of copper micronutrient where as it was positive and non significant for medium and large size group of holding.

The elasticities of Boron (Br) micronutrient (X_8) variable was positive and significant at 1 per cent level for small size group indicates there is scope to use of Boron (B) micronutrient.

The elasticities of molybdenum (Mo) micronutrient (X_9) variable was negative and nonsignificant for there groups and shows no effect on productivity.

At the overall level phosphorus fertilizer (X_2) variable, zinc fertilizer (X_6) variable and copper fertilizer (X_7) variable are positively significant at 1 per cent level of significance their by indicating the scope for the use of these fertilizers. Where as nitrogen fertilizer (X_1) variable is positive and significant at 5 per cent level of significance indicating the scope for the use of nitrogen fertilizer.

5.3.1.2 Coefficient of multiple determination (R^2).

The values of co-efficient of multiple determination estimate were 0.8565, 0.7582 and 0.6215 in the case of small, medium and large size group of holding respectively. It was 0.7454 at the over all level. The value of coefficient

of multiple determination thus indicated that at the overall level the selected nine resources variables together explained jointly 74.54 per cent of variation in the output. The proportion of variation in the output explained by the resources were 85.65, 75.82 and 62.15 per cent in the case of small, medium and large size group of holdings, respectively.

5.3.1.3 Elasticity of Onion production

From Table 5.24 it is observed that in case of onion the elasticities of nitrogen fertilizer (X_1) variable was positive and significant at 1 per cent level for small size group indicates that it is a important variable for which output is responsive. Where as it was positive and nonsignificant for medium and large size group holdings.

The elasticities of phosphorous (X_2) and potash (X_3) variable was positive and significant at 1 per cent level for large size group indicates there is a scope to increase use of phosphorous and potash fertilizers. Where as it was positive and nonsignificant for medium and small size group holdings.

The elasticitis of Iron (Fe) micronutrient (X_4) variable was positive and significant at 1 per cent level for medium size group indicates there is scope to increase use of iron fertilizer. Where as it was positive and non significant for small and large size group holdings.

The elasticitis of manganise (Mn) micronutrient (X_5) variable was positive and significant at 1 per cent and 5 per cent level for large and small size group, respectively indicates there is scope to increase use of manganese micronutrient. Where as it was negative and non significant for medium size group holdings.

Table 5.24 Regression coefficient, standard errors and coefficient of multiple determination for Onion on small, medium and large sized farms

Respondents	Small N=30	Medium N=30	Large N=30	Overall N=90
Constant (Intercept)	17.1794	28.5743	16.4562	21.3421
N (X_1)	0.1628*** (0.02100)	0.2227 ^{NS} (0.4074)	0.0217 ^{NS} (0.1033)	0.2018 ^{NS} (0.0873)
P (X_2)	0.0021 ^{NS} (0.0124)	0.0048 ^{NS} (0.0049)	0.0516*** (0.0194)	0.0073 ^{NS} (0.0660)
K (X_3)	0.0516 ^{NS} (0.0610)	0.0136 ^{NS} (0.0236)	0.1513*** (0.1033)	0.2376*** (0.1861)
Fe (X_4)	0.2208 ^{NS} (0.5130)	0.1116*** (0.3063)	0.0037 ^{NS} (0.0041)	0.1705** (0.0913)
Mn (X_5)	0.1020** (0.0660)	-1.0014 ^{NS} (1.0067)	1.3037*** (0.1638)	0.0161 ^{NS} (0.0963)
Zn (X_6)	1.3670*** (0.7210)	0.2140** (0.1949)	0.0413 ^{NS} (1.0248)	0.3261 ^{NS} (0.4301)
Cu (X_7)	0.1019 ^{NS} (0.1116)	-0.01275 ^{NS} (0.02175)	-0.1312 ^{NS} (0.2038)	-0.0035 ^{NS} (0.0048)
B (X_8)	0.1230*** (0.080)	-0.2610 ^{NS} (0.5138)	0.0051** (0.0016)	0.0096*** (0.0103)
Mo (X_9)	-0.1386 ^{NS} (0.1800)	-0.01390 ^{NS} (0.0038)	-0.6126 ^{NS} (0.8674)	-0.1270 ^{NS} (0.0658)
R ²	0.8362	0.8541	0.8412	0.8104

(Figures in the parentheses are the standard errors of the respective regression coefficients)

- * Significance at 10 per cent level
- ** Significance at 5 per cent level
- *** Significance at 1 per cent level
- NS Non Significant.

The elasticities of zinc (Zn) micronutrient (X_6) variable was positive and significant at 1 per cent and 5 per cent level for small and medium size group, respectively indicates there is scope to increase use of zinc micronutrient. Where as it was positive and non significant for large size group holdings.

The elasticities of copper (Cu) (X_7) and Molybdenum (X_9) micronutrient variable was negative and non significant and do not show any effect on productivity.

The elasticities of Boron (B) micronutrient (X_8) variable was positive and significant at 1 per cent and 5 per cent level for small and large size of holding, respectively indicates there is scope to increase use of boron micronutrient. Where as it was negative and nonsignificant for medium size group holding.

At the overall level, potash fertilizer (X_3) variable, boron fertilizer (X_8) variable are positively significant at 1 per cent level of significance there by indicating scope for the use of these fertilizers. Where as iron (Fe) fertilizer (X_4) variable is positive and significant at 5 per cent level of significance indicating scope for the use of iron fertilizer.

5.3.14. Coefficient of multiple determination (R^2)

The values of co-efficient of multiple determination estimated were 0.8362, 0.8541 and 0.8412 in the case of small, medium and large size group of holding respectively. It was 0.8104 at the overall level. The value of coefficient of multiple determination thus indicated that the nine resource variables together

explained 81.04 per cent of variation in the out put of the vegetable production of all the size groups of holding pooled together. The proportion of variation in the output explained by the resource variables were 83.62, 85.41 and 84.12 per cent in the case of small, medium and large size group of holdings, respectively.

5.3.1.5 Elasticity of Tomato production

From Table 5.25 it is observed that in case of tomato the elasticities of nitrogen fertilizer (X_1) variable was positive and significant at 1 per cent level for large size group indicates there is a scope to increase use of nitrogen fertilizer for this group. Where as, it was positive and nonsignificant for medium size group holdings.

The elasticities of phosphorous fertilizer (X_2) variable was positive and nonsignificant for medium and large size group holdings and shows no effect on productivity of tomato.

The elasticities of potash (X_3) variable was positive and significant at 5 per cent level for large size group indicates there is a scope to increase use of potash. Where as it was positive and nonsignificant for small size group of holdings.

The elasticities of iron micronutrient (X_4) variable was positive and significant at 5 per cent level for small size group and indicates there is a scope to increase use of iron. Where as it was positive and nonsignificant for large size group of holdings.

Table 5.25. Regression coefficient, standard errors and coefficient of multiple determination for tomato on small, medium and large sized farms

Respondents	Small N=30	Medium N=30	Large N=30	Overall N=60
Constant (Intercept)	--	12.262	13.669	12.029
N (X ₁)	--	0.1214 ^{NS} (0.3150)	0.1422*** (0.1042)	0.0407** (0.0301)
P (X ₂)	--	-0.1202 ^{NS} (0.0952)	-0.0912 (0.0648)	0.0418 ^{NS} (0.0538)
K (X ₃)	--	0.0239 ^{NS} (0.0292)	0.4001** (0.1861)	0.1853** (0.0902)
Fe (X ₄)	--	0.2223** (0.1120)	0.1098 ^{NS} (0.1936)	0.0505*** (0.0237)
Mn (X ₅)	--	-0.2588 ^{NS} (0.3944)	-0.0641 ^{NS} (0.0015)	0.0107 ^{NS} (0.0155)
Zn (X ₆)	--	0.2669** (0.1217)	0.5378*** (0.1778)	0.0471** (0.0242)
Cu (X ₇)	--	0.3358 ^{NS} (0.3516)	0.3036** (0.1226)	0.0940 ^{NS} (0.1062)
B (X ₈)	--	-0.0826 ^{NS} (0.1128)	-0.1202 ^{NS} (0.0952)	0.0044 ^{NS} (0.0069)
Mo (X ₉)	--	-0.09651 ^{NS} (0.1386)	-0.0736 ^{NS} (0.0910)	-0.0001 ^{NS} (0.0021)
R ²	--	0.8389	0.8865	0.8627

(Figures in the parentheses are the standard errors of the respective regression coefficients)

- * Significance at 10 per cent level
- ** Significance at 5 per cent level
- *** Significance at 1 per cent level
- NS Non Significant.

The elasticities of managanese (X_5) Boron (X_8) and Mo(X_9) variable was negative and nonsignificant for medium and large size group holdings.

The elasticities of zinc (X_6) variable was positive and significant at 1 per cent and 5 per cent level for large and medium size group indicates there is a scope to increase use of zinc micronutrient for those groups.

The elasticities of copper (X_7) variable was positive and significant at 5 per cent level for large size group indicates that there is a scope to increase use of copper micronutrient. Where as it was positive and nonsignificnat for small size group holdings.

At the overall level, iron fertilizer (X_4) variable are positively significant at 1 per cent level of significance there by indicating scope for the use of these fertilizers. Where as nitrogen fertilizer (X_1) variable, potash fertilizer (X_3) variable, zinc fertilizer (X_6) variable, is positive and significant at 5 per cent level of significance indicating scope for the use of these fertilizer.

5.3.1.6 Coefficient of multiple determination (R^2)

The values of co-efficient of multiple determination estimated were 0.8389 and 0.8865 in the case of medium and large size group of holding. It was 0.8627 at the overall level. The value of coefficient of multiple determination thus indicated that the nine resource variables together explained 86.27 per cent of variation in the output of the vegetable production of all the size groups of holding pooled together. The production of variation in the output explained by the resources were 83.89 and 88.65 per cent in the case of medium and large size group of holdings, respectively.

5.4 Constraints in the use of micronutrient fertilizers

There are many difficulties faced by the farmers in the use of the fertilizers. An attempt was made to find out these constraints. The constraints are listed in Table 5.26.

Table 5.26 Constraints in the use of Micronutrients fertilizer

Sr. No.	Constraints	Respondents	Per cent
1	Lack of knowledge about which, when and how to apply	43	47.77
2	Lack of information about product	37	41.11
3	Requirement of skilled labour	35	38.88
4	Micronutrient fertilizers are costly	27	30
5	No change in productivity	13	14.44
6	Non-availability at required quantity & place	10	11.11
7	Transportation problems	2	2.22
8	Total	167*	-

* more than one constraints faced by the farmer

From the Table 5.19, it is noticed that main constraint in the use of micronutrient faced by the farmers was the lack of information and lack of knowledge about which, when and how to apply micronutrient fertilizer. It was reported by 41.11 per cent and 47.77 per cent sample farmers, respectively.

About 38.88 per cent respondents faced constraint that the liquid or foliar application of micronutrient require more labour to spray on the vegetable crops.

About 30 per cent farmers indicated micronutrient fertilizers are costly. No change in productivity, non-availability and transportation problems are also other constraints reported by the farmers as 14.44, 11.11 and 2.22 per cent, respectively.

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SUMMARY AND CONCLUSIONS

6. SUMMARY AND CONCLUSIONS

Agriculture is the backbone of Indian economy, but now its share in Gross Domestic product has come down. Now, day by day Indian population has been increasing and per capita land is decreasing. To meet the food requirement of growing population we should adopt the improved technology in agriculture. The production of food is not only for self sufficiency but also for export, employment generation, enhancing rural income and also for achieving greater share in global agriculture trade.

Although fertilizer consumption in Maharashtra is increasing at a much faster rate since mid sixties, this increase is reported to have been widely varies from district to district. Fertilizers are yield increasing rather than yield saving inputs. The demand for the fertilizers depends upon the attitude of the farmers. Since it is evident that the minimization of cost is one way of maximizing profit. The other way is making higher sale of product through proper marketing.

For effective marketing, it is very essential to know the purchase behaviour of farmers. Consumer behaviour is the process and physical activities in which individuals engage in allocating acquiring, using or disposing of goods and services. With this aim in view, the present research project entitled, "Behavioural Pattern of Vegetable Growers Towards Use of Ranadey Micronutrients in Satara District" was under taken with the following specific objectives.

- i) To study the behavioural pattern of vegetable growers towards purchase of various brands of micronutrient fertilizers.
- ii) To study the sales promotional strategies adopted by manufacturer

- iii) To study the effects of use of micronutrients on the productivity of vegetables.
- iv) To identify the constraints encountered by the farmers in use of micronutrient fertilizers.

The Satara district of Western Maharashtra was purposively selected for the present study. In Satara district there are 11 tahsils, out of which Koregaon and Khatav tahsils were having more sale of micronutrient fertilizers. So on the basis of highest sale these two tahsils were selected for the study. From these two tahsils 10 villages were selected on the basis of highest area under vegetable crops and more sale of micronutrient fertilizers. Thus the total sample comprised of 90 vegetable growers.

The data pertaining to the various aspects of the study were collected personally from the selected farmers with the help of specially designed questionnaire, by the survey method. The data collected were compiled and analysed for interpretation of results. Both tabular and statistical methods of analysis (Chi-square test and Multiple Linear Regression method) were used to accomplish the objectives of the study.

6.1 Summary

The main findings of the study are presented below.

- 1) As regards the age of the farmers, it was observed that at the total level, proportion of up to 35, 36 to 50 and above 51 years was 28.89, 48.89, 22.22 per cent, respectively.
- 2) As regards the educational status of the heads of the families it was observed at the overall level, that the illiteracy percentage among the heads of families was 8.89 per cent, while that of literacy was 91.11 per

cent. Among the literate category, the proportion of heads having primary, secondary, higher secondary and collegiate was 15.56, 21.11, 21.11, 33.33 per cent, respectively.

3) As regards the size of family at the overall level, it was observed that 46.67 per cent farmers has small size of family followed by 32.22 and 21.11 per cent farmers having large and small size of family, respectively.

4) As regards the social participation at the total level, it was observed that 12.22 per cent farmers has no social participation 25.56, 30.00 and 32.22 per cent of the farmers having low, medium and high social participation, respectively.

5) As regards the size of land holding at the total level, it was observed that 36.67 per cent farmers has medium expenditure on fertilizers followed by 33.33 and 30.00 per cent in low and high expenditure on micronutrient fertilizers, respectively.

6) As regards the annual income of the farmers, it was observed that the total level, proportion of Rs. up to 50,000, Rs. 50,001 to 1,50,000 and above Rs. 150000 was 28.89, 30.00 and 41.11 per cent, respectively.

7) As regards the occupation of farmers, it was observed that the proportion of the heads of families engaged in farming was the highest (66.66 per cent) while the proportion of the heads doing service and business was the lowest. (30.00 and 3.34 per cent, respectively.)

8) The average size of holding of the farmers was 2.66 hectares. Average per farm waste land / uncultivated land, cultivated land, unirrigated was 0.25, 2.41 and 0.81 hectares, respectively. Average irrigated percentage to the cultivated land holding was 60.00.

9) The details regarding the investment in residential buildings of pucca, kaccha and byre at the overall level, was Rs. 18,833.33, Rs. 32,304.66 and Rs. 6,793.3, respectively.

10) At the overall level, the farmers made an investment in implement and machinery was Rs. 2368.54 and Rs. 40049.09 per farm, respectively. In farm implement, the proportion of investment in bullock cart and seeddrill were 5.30 and 0.27 per cent, respectively. In farm machinery, the proportion of oil engine, electric motor, tractor and pipeline were 0.07, 5.54, 82.07 and 6.72 per cent, respectively.

11) The details regarding the land use pattern of the selected farmers indicated that out of the total land holding possessed 9.52 per cent was waste land or uncultivated land. The proportion of cultivated land was 90.48 per cent at the overall level.

12) The cropping pattern of selected farmers was dominated by potato, french bean, jowar, onion and sugarcane. kharif crops, rabi crops, summer crops and annual crops like sugarcane and ginger were shared 44.99, 35.19, 9.89, 7.92 and 2.01 per cent, respectively of the gross cropped area.

13) At the overall level it was observed that, 58.89 per cent respondent preferred Ranadey micronutrient followed by Deepak fertilizers and petrochemicals (23.34 per cent), Ralies India Ltd. (13.33 per cent) and Karnataka Agro Ltd. (4.44 per cent).

14) At the total level, it was observed that maximum number of farmers were received information regarding Ranadey micronutrient from krishi seva Kendra and marketing representative of company 31.25 and 27.67 per cent, respectively. Though other resources viz, friends, neighbour and advanced farmers were 16.96, 10.71 and 13.39 per cent, respectively.

15) At the total level it was found that the farmers (69.70 per cent) bought Ranadey micronutrient in cash and remaining 30.30 per cent farmers bought on credit.

16) The Ranadey micronutrient fertilizer were found at maturity stage in market. The company followed only one marketing channel that was Manufacturer → District distributors → Tahsil Distributors → Krishi seva kendra → Farmers. The Ranadey micronutrient company sales their product only by cash payment and not given any concession or discount pricing or prestige pricing. The Ranadey micronutrient is only available at krishi seva Kendra.

17) In case of the resource use productivities in potato cultivation for different size groups of forms, it was observed that all the nine variables viz, nitrogen (X_1), phosphorous (X_2), potash (X_3), iron (X_4), magnesium (X_5), zinc (X_6), copper (X_7), broron (X_8) and molybdenum (X_9) included in the production function analysis have jointly explained 74.54 per cent of the total variation in the output of potato, at the overall level, whereas it was 85.65, 75.82 and 62.15 per cent incase of small, medium and large size farms, respectively.

18) In case of the resource use productivities in onion cultivation for different size groups of forms, it was observed that all the nine variables viz, nitrogen (X_1), phosphorous (X_2), potash (X_3), iron (X_4), magnesium (X_5), zinc (X_6), copper (X_7), broron (X_8) and molybdenum (X_9) included in the production function analysis have jointly explained 81.04 per cent of the total variation in the output of onion, at the overall level, whereas it was 83.62, 85.41 and 84.12 per cent incase of small, medium and large size farms, respectively.

19) In case of the resource use productivities in Tomato cultivation for different size groups of farms, it was observed that all the nine variables viz, nitrogen (X_1), phosphorous (X_2), potash (X_3), iron (X_4), magnesium (X_5), zinc (X_6), copper (X_7), boron (X_8) and molybdenum (X_9) included in the production function analysis have jointly explained 86.27 per cent of the total variation in the output of Tomato, at the overall level, whereas it was 83.89 and 88.65 per cent in case of medium and large size farms, respectively.

20) Lack of knowledge about which, when and how to apply micronutrient fertilizers was the most important constraint faced by the farmers (47.77 per cent) followed by lack of information about product (41.11 per cent), it requires more labour to spray micronutrient for foliar spray (38.88 per cent) micronutrient fertilizer are costly (30.00 per cent), no change in productivity (14.44 per cent), non availability (11.11 per cent) and transportation problem (2.22 per cent).

6.2 Conclusion

- 1) There was significant association between age of the farmers and use of Ranadey micronutrient fertilizer.
- 2) The percentage of illiteracy of the head of the family decreased as expenditure on micronutrient increased, while percentage of number of users having secondary and collegiate education showed an increasing trend among the size group. There was significant association between education status of the farmers and use of Ranadey micronutrient fertilizers.
- 3) The relationship between size of family and adoption of micronutrient fertilizers was found to be statistically insignificant.

- 4) The low social participation of farmers showed an decreasing trends, while medium and high social participation of farmers should an increasing trends as the adoption of micronutrient fertilizer increases.
- 5) There was no significant association between size of land holding and expenditure adoption of micronutrient fertilizer.
- 6) There was significant association found between annual income and use of the Ranadey micronutrient fertilizers, indicating that as the annual income increases, level of use of these fertilizers also increases.
- 7) The waste, cultivated and unirrigated land showed an increasing trend as size of holding increased in absolute terms.
- 8) The proportionate investment in pucca and kaccha residential buildings and byre showed an increasing trend, as size of holding increased.
- 9) The investment in farm implements and machinery showed an increasing trend, as the size of holding increased.
- 10) The area under kharif, rabi, summer and annual crop showed an increasing trend as the size of holding increased.
- 11) The farmers from study area showed more use of Ranadey micronutrient than any other companies product of micronutrient.
- 12) Farmers received information about Ranadey micronutrient fertilizers from krishi seva Kendra and company representative.
- 13) Most of the users purchasing Ranadey micronutrient fertilizers in cash
- 14) The co-efficient of multiple determination (R^2) in all size groups of farms for potato, onion and tomato crops was worked out to be more than 0.6215, 0.8362 and 0.8389, respectively.
- 15) Lack of knowledge about which, when and how to apply micronutrient fertilizer was the most important problem faced by farmer in micronutrient fertilizer use, followed by lack of information about product.

6.3 Policy implications

- 1) Since the adoption was more in irrigated areas, it is necessary to give attention towards the rainfed area. This should be done by field demonstration plots in the areas having less or no irrigation.
- 2) There is scope to expand the adoption among the illiterate farmers through farmers rallies and demonstrations.
- 3) Application of micronutrients should invariably be based on soil testing results.

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7. LITERATURE CITED

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APPENDICES

8. APPENDICES

Questionnaire - I

1. Name of farmer :

Village :

Tahsil :

District :

Age :

Education:

Occupation :

Information about farmers family.

Sr. No.	Name	Relation of farmer	Age (years)	Education		Occupation	Annual Income (Rs.)
				Start	End		

2. Information about farmers assets.

A. Land holding.

Sr. No.	Type of land	Total Land holding	Barron Land	Cultivated area (Ha)					Current price of land
				Irrigated				Non irrigated	
				Well	Borewell	Cannel	Other		

B. House, Machinery, Implements and animals

Sr. No.	Building	Number.	Current price Rs.
A	Building 1. Home 2. Farm buildings 3. Cattle byre 4. Store house		

Contd..

Contd.

Sr. No.	Building	Number.	Current price Rs.
B.	Machinery and implements. 1. Tractor 2. Oil engine 3. Thresher 4. Electric motor 5. Spray pump 6. Other. 7. Iron Plough 8. Wooden plough 9. Seed drill 10. Hoe 11. Bullock cart 12. Pick axe 13. Other		

Sr. No.	Animal	Breed	
		Local	Cross breed
C	1. Bullocks 2. Cows 3. Buffalo 4. Sheep 5. Poultry birds 6. Other		

4. Social participation of farmers

Sr. No.	Organization	Post
1		
2		
3		
4		
5		

5. Cropping patter

Sr. No.	Season	Crop	Area		Production (qtls)
			Irrigated	Nonirrigated	
1	Kharif				
2	Rabi				
3	Summer				
4	Annual				

6. Source of Information.

7.

Sr. No.	Source	Yes / No.
1	Friends	
2	Neighbours	
3	Advanced farmers	
4	Extension Officers	
5	Krishi Seva Kendra	
6	Marketing executives.	

7. Soil testing is done - Yes / No.

8. Amount of micronutrient is tested - Yes / No.

9. Did you use recommended dose of fertilizers - Yes / No

10. Use of fertilizers.

Sr. No.	Season	Crops	Chemical		Organic			Quantity
			Macro	Micro	FYM	Poultry manure	compost	
1	Kharif							
2	Rabi							
3	Summer							
4	Annual							

11. Micronutrients effect on productivity.

Sr. No.	Crops	Quantity of Micronutrient (Kg).	Company	Production (qtls.)	
				Before use	After use
1	Kharif				
2	Rabi				
3	Summer				
4	Annual				

12. Where did you purchase micronutrients.

- | | |
|-----------------------|-------------|
| a. Krishi Seva Kendra | - Yes / No. |
| b. Weekly market | - Yes / No. |
| c. Agril. Exhibition | - Yes / No. |
| d. Others | - Yes / No. |

13. Mode of payment

- | | |
|-----------|-------------|
| a. Cash | - Yes / No. |
| b. Credit | - Yes / No. |

14. Why did you use Ranady Micronutrients?
- a. Increase in yield - Yes / No.
 - b. Easily available - Yes / No.
 - c. Easy to use - Yes / No.
 - d. Increase in disease resistance in crop - Yes / No.
 - e. Other
 - i. Good quality yield - Yes / No.
 - ii. Easy to market the production - Yes / No.
15. Constraints in use of micronutrients.
- a. Increase in production cost - Yes / No.
 - b. Higher prices of micronutrient fertilizers - Yes / No.
 - c. No. effect on yield - Yes / No.
 - d. Irregular supply - Yes / No.
 - e. Other

Questionnaire - II

1. Distributors Name :
2. Type of marketing
 - a. Holesale - Yes / No.
 - b. Retail - Yes / No.
3. At where micronutrient will be available to sale ?
 - a. Krishi Seva Kendra - Yes / No.
 - b. Weekly market - Yes / No.
 - c. Fair - Yes / No.
 - d. Personally to the farmers - Yes / No.
4. Mode of payment
 - a. Cash
 - b. Credit
5. Which strategies to be adopted for promotion of sale of micronutrients.
 - i. Advertisement in Newspaper - Yes / No.
 - ii. Radio, T.V. Advertisement - Yes / No.
 - iii. Free distribution for Advertisement - Yes / No.
 - iv. Visiting to the farmers land - Yes / No.
 - v. Agril. Exhibitions - Yes / No.
 - vi. Demonstration plots of micronutrients - Yes / No.
 - vii. Training for the farmers - Yes / No.

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VITA

9. VITA

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A candidate for the degree

of

MASTER OF SCIENCE (AGRICULTURE)

in

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