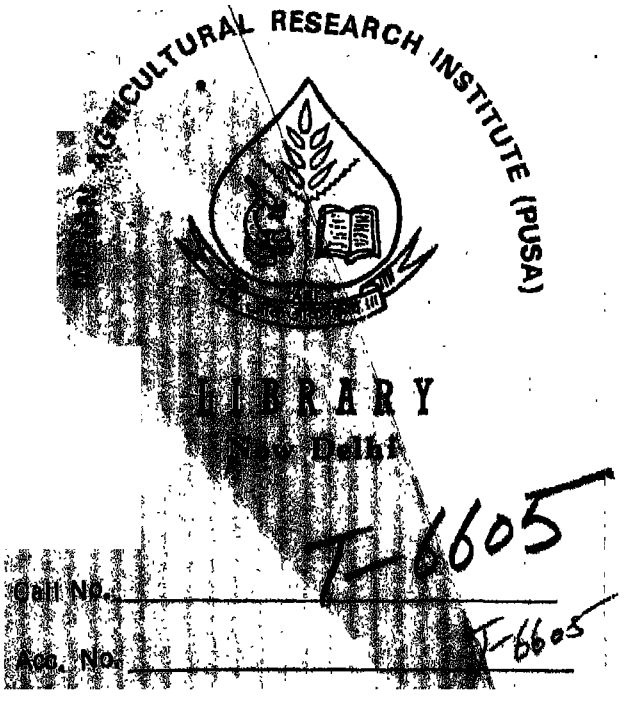

COMMERCIALIZATION OF VEGETABLE CULTIVATION -AN INSTITUTIONAL INTERVENTION

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COMMERCIALIZATION OF VEGETABLE CULTIVATION — AN INSTITUTIONAL INTERVENTION

A Thesis

By

BALKISHAN SINGH

Submitted to the Faculty of the Post Graduate School,
Indian Agricultural Research Institute, New Delhi,
in partial fulfilment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

IN

AGRICULTURAL EXTENSION

1999

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This is to certify that the thesis entitled, **"Commercialization of Vegetable Cultivation — An Institutional Intervention"**, submitted to the Faculty of the Post-Graduate School, Indian Agricultural Research Institute, New Delhi, in partial fulfilment of the requirements for the award of the degree of **Doctor of Philosophy in Agricultural Extension,** is a faithful record of *bona fide* research carried out by **Mr. Balkishan Singh** under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of these investigations, have been duly acknowledged by him.

Rekha Bhagat

Date: December 27, 1999

(Rekha Bhagat)
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Place: New Delhi

ACKNOWLEDGMENT

I take the privilege to express my esteem and profound sense of gratitude to Dr. (Mrs.) Rekha Bhagat, Sr. Scientist, Division of Agricultural Extension, IARI, New Delhi for her learned counsel, sagacious guidance, kind encouragement and constructive criticism all along the investigation and organisation of this thesis. Her sympathy and generosity have been much beyond her formal obligation as the Chairperson of my Advisory committee, for which I am deeply indebted to her.

Words fail to express my deep sense of indebtedness to Dr. S. Veerasamy, Professor, Division of Agril. Extension, IARI, for providing expert suggestions for this study.

I express my profound sense of gratitude to Dr. Baldeo Singh, Head, Division of Agricultural Extension, IARI., New Delhi for his immense interest, ungrudging help and affection.

I record my sincere appreciation and gratitude to the members of my Advisory Committee, Dr. Baldeo Singh, Head, Division of Agricultural Extension, IARI, Dr. Ram Bahal, Sr. Scientist Division of Agricultural Extension, IARI, Dr. R.C. Gautam, Head, Agronomy Division, IARI, Dr Rajendra Prasad, Sr. Scientist, IASRI, New Delhi for their continuous help and valuable suggestion during the course of this study.

I am highly indebted to Dr. B.P. Sinha (Retd.) (Ex. head) of the Division of Agricultural Extension, Dr. Mahipal, Head, TOT, CRIDA, Hyderabad, Dr. S. P. Singh, Sr. Scientist, Modipuram (Meerut), Dr. B. S. Sharma, Principal Scientist, IASRI, New Delhi for their wise counseling and guidance throughout the present endeavour.

I also record my grate fullness to Mr. Surender Singh, Mr. Randheer Singh, Mr. Dalal of mother dairy and all the staff of CATAT, engaged in the field activities for their constant help rendered during the period of my survey. I am delighted to express my indebtedness to all my colleagues and friends for helping me from time to time.

I sincerely owe my thanks to Dr. R.B. Singh, Director, IARI, New Delhi for granting me study leave to pursue studies leading to Ph.D. degree and for providing me financial assistance in the form of senior research fellowship in completing the research work.

I feel grateful to Sh. Dinesh Kumar for typing this manuscript patiently.

I will be failing in my duty if I do not express my deep sense of gratitude and indebtedness to my parents, elders, my wife Urmila Singh and children Raghvendra, Rohit and Anuj for their patience, constant inspiration and encouragement during my study period.

Lastly, I record my sincere thanks to all who helped me in this study and could not find a separate mention.

IARI, New Delhi
December 27th 1999

[BALKISHAN SINGH]

Dedicated to my wife
Smt. Urmila Singh

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LIST OF ABBREVIATIONS USED

A.I.	-	Artificial Insemination
AEO	-	Agricultural Extension Officer
APAU	-	Andhra Pradesh Agricultural University
BDO	-	Block Development Officer
CATAT	-	Center for Agricultural Technology Assessment and Transfer
D.M.S.	-	Delhi Milk Scheme
DDA	-	Delhi Development Authority
DHO	-	District Horticulture Officer
F&V Scheme	-	Fruit and Vegetable Scheme
F.M.D.	-	Food and Mouth Disease
H.S.	-	Haemarrhagic Septicaemia
IARI	-	Indian Agricultural Research Institute
ICAR	-	Indian Council of Agricultural Research
ICMR	-	Indian Council of Medical Research
IVLP	-	Institute Village Linkage Programme
M.D.	-	Mother Dairy
NCT	-	National Capital Territory
NDDB	-	National Dairy Development Board
R.P.	-	Rinder Pest
SAUs	-	State Agricultural Universities
SPSS	-	Statistical Package for Social Sciences
U.P.	-	Uttar Pradesh
VDO	-	Village Development Officer

Chapter - I

INTRODUCTION

India is the second largest producer of vegetables in the world next only to China by producing about 71.66 million tonnes of vegetables annually from 6.20 million hectares of land. Our country has progressed significantly during the past 3-4 decades in developing high yielding varieties/hybrids of different vegetables with their improved qualities and standardised agro-techniques suitable for different agro-climatic conditions. With the concerted efforts of State Agricultural Universities (SAUs), Indian Council of Agricultural Research (ICAR) and by the involvement of private sector, our per capita vegetable consumption has increased from 80 to 135 grams per day. Adequate infrastructural support, appropriate policy, less price fluctuation and increasing demand for improved seed have contributed significantly in bringing the awareness among producers, consumers, marketers and policy makers about the vegetable production.

The development of several scores of open-pollinated varieties in almost all popular vegetable crops with higher yields, some having

resistance to biotic and a biotic stresses, has made it possible to produce vegetables for extended periods and in different seasons. The production of vegetables as well as their consumption pattern have spread even in non-traditional areas.

Despite such a progress made in the field of vegetable crops, India is still far behind several countries. The present per capita consumption of 135 grams vegetables per day is far below the recommended requirement of 280 gram per capita per day. By the turn of the century, our requirement of vegetable production will be 110 million tonnes to feed one billion population. The cultivable area being limited, we have to increase the productivity. These facts call for massive efforts to develop hybrids and their seed production and improve production technology. At present our productivity level is about 11 tonnes per ha which should be increased to the level of 25-30 tonnes per ha to achieve the targets (Singh, 1997). Cultivating vegetable is highly remunerative as they supply regular income to fullfil partial food needs and fodder, provide regular employment to family labours and utilise agro-resources efficiently. Vegetable cultivation is not getting as popular as it should be among growers because of high input costs, lack of irrigation facilities and difficulties in their marketing and storage. It is estimated that 20-40 per cent of nearly 100 million tonnes of

fruits and vegetables produced annually and valued at Rs. 4000-5000 crores is lost in India due to inadequate post harvest management. (Mani, 1998)

1.1 Delhi State and Vegetable Cultivation

Delhi state represents a new set of farming situation which is typical of agriculture around expanding urban areas. Delhi city has already devoured large chunk of agricultural land for habitation and the farmers near the city have either sold their land or are trying to earn livelihood out of smaller pieces of land. Intensive cultivation of vegetables, fodder and other selected cash crops is done by the farmers. Land is a costly resource and the returns are low. Traditional crops like cereal, pulses and oil seeds are gradually giving way to cash crops. However animal husbandry remains an important enterprise.

Due to the faster rate of urbanisation and industrialisation, rapid migration of people from the village to city, conversion of joint families in to nuclear families and subsequent division, fragmentation of land and land acquisition by the Government in the state, the per capita land availability is decreasing. Therefore, in all the above six community development blocks of Delhi state, only 3 blocks namely, Alipur, Najafgarh and Kanjhawala have the agricultural land. Keeping in

view, all the above factors there is a strong need for change in the existing cropping system. Therefore, the urgent need is to diversify, modernise and commercialise the agriculture to meet the demand of unemployment, food for the growing population and to obtain more income from the available land. Out of these 3 blocks, only Alipur block has tremendous potential of integrated farming including vegetables. There is a vast scope of introducing "hi-tech-vegetable production technologies" in this Block, because this area has good quality of land, water, human resources, means of transport and marketing facilities. Therefore, there is a strong need to commercialise vegetable cultivation in the area.

1.2 Mother Dairy Institutional Intervention

Keeping in view, the above problems and prospects in the area, the 'Mother Dairy' started its Fruit and Vegetable (F&V) Scheme in 1994 with the main objective of linking producer to the consumer without the intervention of middlemen. This project has been set up to provide a direct link between the fruit and vegetable growers on one hand and the consumers on the other. From procurement to marketing, the project handles the entire range of operations.

At present, there are 178 mother dairy booths. Out of this, 11 are in Noida (UP) and thus the total number of booths in Delhi is 167.

The project was initially funded by the National Dairy Development Board (NDDB). But now, it is fully managed at the Mangolpuri Head Office under the leadership of the General Manager. The project management structure includes 12 departments, the major ones being personal, human resources, procurement, marketing operations and finance, having sectional heads for each department.

Based on crop plans worked out in discussion with farmers, produce from villages around Delhi and many other states are received at the cold storage complex at Delhi. Farmers are given remunerative prices for their produce. Payment is made by cheque on the basis of quality determined by weighing the produce at the complex. Standards are being defined for each fruit and vegetable so as to link price to quality. Procurement specialists and trained field staff help the farmers in crop management and protection. Efforts are being made to introduce new seed varieties and scientific methods of agriculture to increase the yield and improve the quality of produce. Seed multiplication and demonstration farms are also being planned.

A vast complex has been set up at Mangolpuri, New Delhi that receives, sorts, grades and despatches to retail outlets over 30 items a day. Specially designed plastic crates are used through the entire system, from procurement of some of the produce at the shops. An on-line computer is used for most of the operations, from receipts, weighment, storage and dispatch to invoicing. Produce sent daily from the procurement centres is received and weighed on electronic weigh bridges and the weight automatically transmitted to the computer. The produce is then graded on the various sorting, grading lines for different types of produce, material handling of such large quantities of produce is done by using crates, pellets and fork lifts.

Large cold storage chambers, with temperature and humidity conditions adjusting to the required setting of a particular fruit and vegetable are used to store the produce. Controlled atmosphere chambers are used for long term storage and ripening rooms ripen certain items like bananas and tomatoes. A very modern refrigeration plant using high capacity screw compressors and specially designed diffusers cater to the above requirements. Some vegetables and fruits are frozen on mechanised preparatory lines and a continuous belt type freezing tunnel with a capacity of 2000 Kilos per hour. This machinery uses the most advanced freezing technology. Skilled technologists

control each aspect of the operation. Quality control checks at each storage ensure that the laid down standards for produce are maintained.

Specially designed modern retail outlets, first of their kind in India, have been set up in various localities of Delhi. The number of Booths has increased from 12 to 178 presently and the number is likely to increase to 200 shortly. Out of the 167 booths in Delhi, 72 booths are located in south zone, 51 booths in west zone, 22 booths in north zone, 18 booths in east zone and 4 booths are located in the central zone.

Each shop caters to a large number of customers, with a capacity to sell up to 1600 Kg. of vegetables and fruits a day. The shops are equipped with small cold storage's and electronic machines to weigh the produce and print itemised bills. There is a wide variety of frozen products sold at the booth under the name 'SAFAL'. The range of products includes Safal Peas, Tomatoes, Cauliflower, Ladyfinger, Spinach, Mixed Vegetables and Capsicum. Products of other co-operatives are also sold at the booths such as Oil, Cheese, Butter and Shrikhand. The entire system of daily delivery of fresh produce to the shops and their running and maintenance is handled by a team of marketing professionals. The project is designed to handle 1,20,000 mt.

of fruits and vegetables annually. A pre-fabricated building spread over 2 ha. of land and comprising receipt and despatch docks, a sorting-grading hall, cold storage and freezing equipments were installed and commissioned in a record time of 15 months. A super mini on-line computer system with 50 terminals has been installed to handle information and decision making needs and other computation jobs.

The fruit and vegetable booths have generally been located next to the mother dairy milk booths. The layout plan and size, the equipment available, the storage facility and the personnel managing is same for all the booths. Each booth is allotted to an ex-serviceman (known as concessionaire), who is the over all in-charge for managing the booth. He has two helpers, who can be employed or concessionaire's family members. These helpers are supposed to under go a special training for handling the equipment. The booths are open from 8.30 a.m. to 8.00 p.m. (Lunching 1.00 to 4.00 p.m.) on all week days and Saturdays. These booths are also open till 1.00 p.m. on Sundays in some of the localities. There are regular inspections of the booths by the field staff from the head office.

The fruit and vegetable booths have been located next to the already existing milk booths due to the following reasons.

- The initial purpose was proximity to the milk booths which were already set up. This would enable the consumers to buy fruits and vegetables, along with milk, which are also regarded to be bought daily.
- There were no problems in getting land from DDA.
- Certain equipments could be used simultaneously at the milk and the fruits and vegetable booths.
- The milk booths are scattered all over Delhi, so these booths would also have an extensive coverage.
- The milk booths which were present gave an idea of population inhibiting a particular area and standard of living of inhabitants.

The fruit and vegetable growers do not have any problem regarding pricing, marketing and distribution of produce as this is looked after by the professional at the head office. It is made sure that at least 55 per cent of the profit reach the actual growers. NDDB is catering to the village level farmers. NDDB encourages co-operatives by forming associations so that they manage affairs of their own, to protect their interests and regulate activities of their own.

Thus, the fruit and vegetable project which is a pilot-project has seen gradual expansion in the form of 178 booths over the past 4 years. The authorities have plans of further expansion with the target of 200 booths in the city in the near future. Since the project has the primary objective of providing good quality of fruits and vegetable (both fresh and processed) at reasonable rates to the consumers.

1.3 Statement of the problem

Due to certain inherent weaknesses and constraints the poor vegetable growers have not been able to derive proportionately the same degree of benefits from modern vegetable technologies as has been the case of bigger farmers. This is partially attributed to relatively less applicability of non-traditional modern vegetable production practices to the conditions of the poorer vegetable growers, poor marketing and storage facilities etc. Vegetable farming has, however, a great potentiality and scope for improving socio-economic condition of small and marginal farmer.

The vegetable production gives high yields and high economic returns within shorter period as compared to general and seasonal crops. The modern production technology of vegetable production has not, however, been adopted on mass scale by majority of the vegetable

growers in the country. One of the reasons for this may be that agricultural extension agencies do not have appropriate organisational structure to educate and train the vegetable growers with regard to various hi-tech-production technology of vegetable growing. Another reason could be that there is no assured input supply such as good quality seeds and related inputs for achieving higher production. There is no assured arrangement for regular and remunerative organised vegetable market for the disposal of various vegetables. Further, a single source of information is not adequate to disseminate all types of hi-tech-production technology as related to quality production of various vegetables. In other words, there are problem of appropriate hi-tech; assured input supply, assured marketing and inadequate information sources etc.

In addition, there are several other constraints operating in actual situations of vegetable growers which make the job of extension agencies very difficult. The vegetable growers also find a complex interplay of a number of factors such as socio-personal-economic, psychological, communicational, situational and ecological, while profitability and feasibility of the hi-tech-production technology of vegetable it self, make it a difficult choice in accepting or rejecting in delaying or hastening the adoption of the introduced improved package

of practices and hi-tech-technology of vegetable production for the farmers. The socio-psychological make up of non-member vegetable growers is also responsible to a certain extent in adopting improved package of practices for production of various Mother Dairy member vegetable growers.

Our achievements in the wake of green revolution have not been uniform in all crops and throughout the country. Likewise, the adoption of improved vegetable production technologies and highly commercial vegetable production with special reference to export quality have almost remained confined to a fewer number of farmers. Thus, wide disparities have emerged between different districts and between different villages in the same district. Such disparities required greater attention to be looked into critically and remedial measures may be initiated to over come these difficulties as far as possible through various special programmes of vegetable production in the villages which may have relatively made little progress in the past despite having potential for vegetable production. It does not, however, imply that the villages which are adopted by the Mother Dairy need not be further developed.

The present study Commercialisation of Vegetable Cultivation – An Institutional Intervention endeavours to focus on the role played by the fruit and vegetable schemes in meeting the farmers-consumers demand. Keeping these possibilities in view, the present investigation was designed with the following specific objectives.

1.4 Objectives of the study

1. To study the socio-psychological profile of vegetable growers.
2. To study the socio-economic, infra-structural correlates of commercialisation of vegetable cultivation.
3. To explore into the factors promoting farmers' participation in the institutionalised endeavour.
4. To study the farmers views and suggestions to improve commercialisation of vegetable cultivation.

1.5 Limitation of the Study

Keeping in view the limitation of time, funds and other resources available at the disposal of the investigator, the study was confined to only two villages of a state with a total sample of only 100 respondents. The major limitation of the study is that findings are based on the expressed responses of vegetable growers. However, every care has been taken to obtain objective, reliable and valid responses by applying

the relevant methodological techniques. Thus, the result of this study will be applicable, only to the area under similar situations with regard to man and material of ecology.

1.6 Plan of Study

The study has been planned in the following chapters.

- Introduction
- Review of literature
- Research methodology
- Results and discussion
- Summary and conclusions
- Implication and suggestion

References and appendices have been given at the end.

Chapter - II

REVIEW OF LITERATURE

A systematic review of relevant literature forms an integral part of any research project. It helps a great deal in defining the problem, formulating the specific objectives, deciding the methodology and discussing the findings of the project in hand. An attempt is made here to review the empirical research work done by numerous scholars in India and abroad. The available materials are grouped into several categories. They are: trend and growth rate in horticultural development; labour use and employment; cropping pattern; costs and returns; marketing, and constraints in vegetable cultivation.

2.1 Trend and Growth Rate

According to the Economic Survey of Maharashtra (1996-97), the state Government has undertaken a programme to promote horticultural development through establishment of nurseries and granting them capital subsidy to small and marginal farmers to encourage them to grow selected fruit crops. Horticultural development is emphasized because horticultural crops yield much

more return than the conventional food grains. Conventional food grain crops yield only Rs.4,000-12,000 per hectare. While horticultural crops have very high yield pèr hectare i.e., Rs.0.75 lakh (Sweet orange), Rs.1.69 lakh (Banana), Rs.2.07 lakh (Mango) and Rs.3.47 lakh (Grapes).

The Maharashtra Government policy aims to strengthen the competitive resolve of the farmers in the light of emerging global scenario with a view to take full advantage of the emerging opportunities. Commercialization and diversification intended not only to liberate the farming community in general and small and marginal farmers in particular from the poverty trap but also to meet the countries growing demands for fruits, vegetables etc. which generally show rising trend with increasing levels of per capita income in the economy.

Satyasai and Viswanathans' (1996), study on diversification of Indian agriculture and food security revealed that the area and production of fruits and vegetables in the country have been growing. It is 12 per cent for grapes, 5 per cent for oranges and nearly 6 per cent for cashewnuts. The study reveals that the output levels of banana and onion have been increasing in Maharashtra. These have not, however, kept pace with the rise in the country's total production.

Sawant (1997), observed in his study that the trend towards crop diversification had not been very strong and it restricted to a few regions and states. This was all the more true about diversification towards horticultural crops, its highly desirable role in improving the nutritional status of the population. The major hurdles as we envisage are inadequate supplies of good quality seeds and planting materials suited to various areas and the poor state of development of marketing infrastructure for them.

Vishvanathan and Satyasai (1997), studied fruits and vegetables production trends and role of linking. The value of output from fruits and vegetables showed a growth rate of 5.76 per cent between 1960-61 and 1992-93. They observed that among the individual crops, potato showed the highest rate of growth at 7.28 per cent per annum followed by banana at 5.7 per cent per annum. The share of fruits and vegetables in gross value of output from agriculture increased from 7.36 per cent in 1960-61 to 12.23 per cent in 1992-93. The share of banana, potato and tapioca, were observed to be more than doubled.

2.2 Labour Use and Employment

Saini and Singh (1985), observed that diversification of crop farming with high yielding milch animals can play an important role in maximizing income and employment on small farmers.

Ramesh Chand (1996), estimated that one per cent shift in area from other crops to off season vegetables would lead to 1.20 and 1.60 per cent growth in the existing level of labour employment 3.40 and 4.02 per cent growth in income depending on whether the shift takes place in irrigated or unirrigated area. Estimate show the potential of diversification through high value crops on "on farm" employment opportunities and farm income. It was observed that vegetable cultivation reduces seasonally, in labour use because the peak time of labour requirement of vegetable crops differ from the peak labour demand in most of the other crops.

Rao (1997), attempted to workout higher employment and income potential of horticultural crops in three districts of Rayalseema region in Andhra Pradesh i.e., Chittor, Cuddapah and Kurnool. It was observed that the highest number of man days of employment was observed in the flower crops i.e., jasmine and crossandra with 1210 and

913 man days. Among the fruit crops, papaya needed higher employment of human labour of 704 man days per hectare compared to other fruit crops due to higher yield and continuous harvesting throughout the year. Among the vegetables, brinjal required higher labour 439 men days per hectare followed by ladyfinger with 314 men days and tomato with 236 men days respectively. Labour employment on field crops which range from 285 men days on sugarcane to 104 men days on groundnut was comparatively low with the exception of mango crop.

Singh (1998), found out in his study on potential of diversification towards high value crops in Maharashtra. The labour requirement for cultivation of vegetable crops was high. The average number of man days required per acre of onion cultivation was 113 followed by ladyfinger 60 man days, and tomato 55 man days. In food grains, man days required for cultivation were less than 50 per cent requirement of vegetable cultivation.

Langvath (1991), reported that annual primary production of vegetables something like 8,000 employment years in Norway if part time employment is taken into account. Men work 2/3 and Women 1/3 of this total.

Parthasarathy and Pathana (1983), while studying on the transition of the agriculture towards capitalism in west Godavari district of Andhra Pradesh setup the indices as: (1) Hired labour use relative to family labour use (2) rental income (3) output levels per hectare and marketed surplus (4) use of modern inputs (5) investments per hectare and (6) rate of surplus value, rate of profit and reinvestments. They concluded that the indices show concentration of considerable surpluses with around 16 per cent of the total cultivating households. These surpluses are divided out of large ownership and control of land and with use of wage labour.

Desai *et al.* (1970), studied the impact of high yielding varieties of groundnut, bajra, wheat, jowar and cotton on per hectare employment of casual labour. It was much more in case of HYV groundnut, bajra and cotton. In the case of wheat, the total wage bill for improved variety was found to be lower than the local variety.

Garg and Prasad (1974), estimated the labour requirements of several vegetables and showed that the labour intake was highest in case of onion (149.5 man days) followed by tomato (144 man days), brinjal (133 man days) and ladyfinger (92 man days). The analysis also showed that out of the total labour days utilized, the family labour

accounted for the greater share, varying from 64.59 to 81 per cent for different vegetable crops.

Saraf and Mishra (1987), revealed that tomato and brinjal were labour intensive crops. With increase in farm size, an inverse relationship of family labour and own bullock labour, direct relation of casual labour and no relation of bullocks labour were reported.

2.3 Cropping Pattern

Varadarajan and Elangovan (1996), studied the scope for commercialization of small farm agriculture in Madurai district of Tamil Nadu. Based on the primary data collected from the 200 farmers, they observed that cash crop accounted for 22 per cent area only showing the farmer's preference to food crops in gross cropped area. It was as high as 90 per cent on small farms as compared to 60 per cent on large farms. The large farms were found to grow cash crops in about 54 per cent of their area. Therefore, the commercialisation of agriculture would need attention to small farms, to encourage area under cash crops.

Atibudhi (1997), attempted to study constraints to horticultural development in Orissa. He observed that the important fruits grown in

the state include mango, coconut, banana, citrus and papaya accounting for 34.24, 20.37, 8.93, 7.89 and 5.80 per cent of the total area under horticulture respectively. The average growth rate was found to be positive for area and production for all the crops except potato. The growth rate for yield was found to be negative for mango and citrus fruits.

Reddy (1985), identified Guntur district of Andhra Pradesh as one of the leading district with regard to commercialization of agriculture. As the district is well known for commercial crops like, tobacco, chillies and cotton after the advent of Nagarjun Sagar Water in 1968-69. These crops accounted for 15.6 per cent of the total cropped area of the district in 1980.

Gadre and Bhole (1997), studied status and prospects of minor fruits in Viderbha region on Maharashtra state. Based on primary and secondary data they observed that the area under minor fruit crops in the region was 7095 hectares constituting 0.12 per cent of the gross cropped area of the region. Ber, custard apple and pomegranate covered about 90 per cent of the area under the minor fruit crops.

Saleth (1997), studied on diversification strategy for small farmers and landless in Tamil Nadu by selecting 218 house holds from 4 villages

representing each of the four agro climatically distinct regions of the Tiruchirapallu district. He observed that for the same sample as a whole food grains account for 41 per cent of the gross cultivated area (GCA), followed by oil seed (27 per cent), commercial crops (27 per cent) and vegetable and horticultural crops which have the least area share (< 3 percent), that too confined mostly to larger farms.

Singh (1998), reported that the area under vegetable crops has gone up from 1514 thousand hectare in 1950-51 to 5970 thousand hectare in 1994-95. The share of vegetables and fruits has, accordingly, gone up from 1.8 per cent in 1950-51 to 3.5 per cent in 1990-91 and 7.2 per cent in 1994-95.

Singh and Chauhan (1971), selected Saraidha village in Farukhabad district of Uttar Pradesh as having higher extent of commercialization in agriculture than that of the average for Uttar Pradesh or for the country as a whole based on the cropping pattern and production pattern. Special crops such as groundnut and potato occupy important position in the cropping pattern of holdings. Fifty six per cent of the cropped area is devoted to crops, whereas, 10 per cent to pulses and the remaining accounted for special crops. Another feature is that the farmers preferred non-mixed crops against mixed crops.

Average yield of crops or productivity was also higher in that district in comparison to other districts of Uttar Pradesh.

2.4 Costs and Returns

Ramesh Chand (1996), studied that in the Himalayan Region of Himachal Pradesh, tomato is the most important crop in the area grown by 95.3 per cent of the sample farmers on 12.73 per cent total cropped area and 40 per cent of the area under vegetable crop. Tomato yielded output worth more than Rs.45,000 in Deothi and Dharat per acre of irrigated area. Bhojnagar farmers harvested output worth Rs.16,972 under similar conditions. He found that the net returns from tomato were many a times higher in the villages located around road side as compared to the distant villages. It was also observed that the scope for raising income and productivity of diversification through tomato crop is important among all vegetables.

Dahiya and Singh (1997) estimated that the cost of cultivation of fruits is higher than that of vegetables and cereal crops. The total cost per hectare in fruit crops ranges between Rs.41,288 for apple and Rs.11,606 for citrus fruits. It was Rs.10,568 for vegetables and Rs.7,932 per hectare for potato. In the case of cereal crops the average total cost

of cultivation per hectare was Rs.2,928 for maize and Rs.2,670 for wheat. Net returns per hectare were Rs.28,745 in apple and Rs.10,814 in citrus fruits while in vegetables, potato, maize, wheat and paddy net returns were Rs.6,940, Rs.3,913, Rs.259, Rs.894 and Rs.658 respectively. They also found that the output per rupee of input was also higher in fruits than in vegetables and cereal crops.

Singh (1998) found that the cost incurred per acre of tomato accounted to Rs.13,500 the net returns realized was Rs.9,000 in case of onion the cost per acre was Rs.7,700 and net returns realized was Rs.8,950. The total cost and returns for ladyfinger was Rs.5,000 and Rs.6,000 respectively. He also found that among the food grain crops, the cost incurred in wheat was higher (Rs.3,250) followed by jowar (Rs.2,900) and net returns realized was Rs.1,950 and 2,833 respectively. The benefit-cost ratio was highest in other vegetables due to low cost as compared to net returns. Tomato had given highest net returns per acre but benefit-cost ratio was the lowest. It is because of high cost of insecticides, fungicides, harvesting, packaging and transportation. The average cost per acre of vegetable cultivation was much higher when compared to food grains as its production involved both labour and capital intensive techniques. However, the net returns were higher in

vegetables and grapes due to higher yield and better marketing realization as compared to food grain.

Alam (1998), reported that the horticulture offers good opportunity to farmers. In place of Rs. 10,000 to 20,000 per hectare income from the food grains, they can earn Rs. 20,000 to 80,000 per hectare from vegetables.

Koay and Loh (1990), found in their study that labour and pesticides accounted for more than 70 per cent of production costs.

Rao (1997) estimated that among the vegetable crops, brinjal yield was about 294 quintals as compared to 152 quintals of tomato and 142 quintals of ladysfinger. Gross returns were higher for papaya (Rs.1.23 lakhs) per hectare followed by banana Rs.98,571, jasmine with Rs.65,279 and brinjal Rs.62,252. Of three vegetable crops, gross returns from brinjal were considerably higher than ladysfinger (Rs.34,600) and tomato (Rs.31,563). Study also revealed that net returns were higher from the production of fruit, vegetable and flower crops as compared to field crops. Net returns were found to be maximum from papaya with Rs.82,298 compared to other fruit and all other crops, followed by Rs.52,082 from banana. Brinjal gave the next highest net returns of Rs.34,641 compared to Rs.12,999 from ladyfinger and Rs.9,737 from

tomato even though the cultivation costs of brinjal were higher by around Rs.9,000 over other vegetable crops. Fruit crops revealed higher benefit-cost ratio, followed by vegetable and flower crops and lastly field crops. Lower yield and higher production costs due to intensive and continuous cultivation were mainly responsible for lower benefit-cost ratio.

Singh (1997), found that growing of vegetables are 4-8 times more remunerative than cereals in our country and other field crops and also vegetable cultivation generates more employment in the rural areas.

Pal (1998), found that the distribution cost of perishable horticultural produce is assumed 5-9 times the production cost. He also observed that packaging accounted for 25-50 per cent of the wholesale price of fruits and vegetables.

Maorthia and Gupta (1996), reported that small vegetable growers usually prefer to sell their vegetables directly to the consumers due to high cost of transport charges but medium and large vegetable growers sold their produce to retailers through commission agents.

Mellor (1969), argues that investment in irrigation facilities or the infrastructure of research; education, transportation and power facilities

may remove the economic barriers to adoption of new technology and thereby provide the basis for borrowing income disparities.

Sen (1969), computed three indices of income in equality for each state to conclude that the new technology may change the pattern of regional growth of agriculture output and income and it is not likely to significantly alter the distribution of agricultural income within the states.

Ray (1970), found a high association between income concentration and fertilizer use and indicates that the disparities in farm income widened as a result of the new agricultural technology.

Rao (1997), observed that the expenses incurred on banana were the highest being Rs. 46,489 per hectare followed by jasmine with Rs.40,415 and papaya with Rs.40,415. The total cost was the lowest on groundnut (Rs.14,521) followed by mango (Rs.15,068). Among the crops, investment was higher on fruit crop with the exception of mango, followed by flowers, vegetables and lastly on field crops with the exception of sugarcane. Of all the operational costs, human labour constituted the major cost component accounting for the highest share on all crops with the exception of mango share. It ranged from 45.74 per cent on ladysfinger to 18.17 per cent on groundnut. The amounts

spent on human labour were high on flowers, vegetables with the exception of tomato followed by fruits and field crops.

Saleth (1997), found that in small farms (0-2 acres), the comparative advantage lies in the cultivation of oilseeds especially groundnut based on income cost ratio and commercial crops especially 'korai' based on the net returns. Among two farm groups i.e. 2-4 and 6-10 acres horticultural crops such as lemon, flowers and mango have a comparative advantage over other crops irrespective of the performance measure being used. For medium farms (4.6 acres), the comparative advantage lies in vegetables showing the highest income cost ratio of 26:79. Among larger sized farms the crops having a comparative advantage are pulses based on income cost ratio and horticultural crop based on net returns.

Mital and Srivastava (1975), reported that the cost of production of bulb crop of onion was Rs.4,700 per hectare. Among the cost components, irrigation charges accounted for the highest share followed by the cost of manures and fertilizers pointing out that the gross income and net profit per hectare were Rs.7,500 and Rs.2,800 respectively. They also estimated that the per hectare output on onion was 300 quintals.

In a survey conducted by the Department of Horticulture College of Agriculture, Rajendra Nagar, APAU (1980), it was estimated that the gross returns from brinjal, tomato, chillies and ridge gourd were Rs.12,000, Rs.15,000, Rs.25,000 and Rs.10,000 respectively. The net returns for the same crops were Rs.6,905, Rs.9,450, Rs.16,570 and Rs.5,620. The yields of brinjal, tomato, chillies, ridge gourd and ladyfinger were reported to be 20, 30, 20, 10 and 10 tonnes per hectares respectively.

Singh (1982), analysed the vegetable farming around Hyderabad and concluded that the investment on vegetable farming has resulted in substantial profit. Further, it was pointed out that the profit ability was higher for tomato followed by ridge gourd, brinjal, chillies and cluster beans. The study indicated the break even output for tomato at 7.06, 4.83 tonnes for brinjal, 6.31 tonnes for chillies, 2.47 tonnes for ridge gourd and 1.14 tonnes for cluster bean.

2.5 Constraints in Vegetable Cultivation

Dantwala (1986), in his study on price and cropping pattern revealed that a number of factors influence vegetable cultivation e.g. changing cropping pattern, including the differential rate of

technological change among crops, the spread of irrigation leading to shrinkage of area under dry crop, market intervention and support by the government.

Jha (1996), reported that the several factors were identified as determinants of the extent of diversification such as agro-climatic and land suitability, infrastructure including market, institutional support, technology and policy environment. In addition, the structure of the factor market, particularly the labour market was identified as an important variable.

Varadrajan and Elangovan (1996), suggested that to achieve commercialization of agriculture, alternative crop pattern based on horticultural and allied activities may be identified to maximize net income of the farmers. Secondly, collective action such as group farming or cooperative farming is to be encouraged. Thirdly, continued subsidy on inputs will be of help in the marketization of farm sector.

Subramanyam and Sudha (1996), studied diversification on small farms through horticultural crops in Kolar district of Karnataka for the year 1992-93. They suggested that to take advantage of the new technology developed in horticulture crops, it is essential to protect the cultivators especially the small farmers from the price risk faced by

them due to seasonal gluts and perishability of horticultural crops. To over come this price risk, it was suggested that linking processing with production and marketing and price support should be under taken besides adequate credit arrangement.

Maji and Rahim (1996), pointed out that India is second to China in the production of vegetables, 30-40 per cent of our total vegetable production gets damaged before it reaches the market. The results of the study based on the whole farm analysis of cost and returns point to the conclusion that diversification per square is not the panacea for the small and marginal farms. What is needed is cold storage facilities, transportation, grading, quality control and standardization and above all an effective organization which will be responsible for linking production and marketing thereby ensuring a higher price and income to the vegetable growers especially the small and marginal ones. Since high value agricultural commodities are generally more perishable, implementation of crop insurance programme becomes a necessity for the promotion of the interest of the small and marginal farms. Research not only to enhance production but also to improve the quality of these perishable products has to be undertaken.

Ramesh Chand (1996), indicated that there was strong evidence that it is not the farm size but infrastructure like access to motorable roads, markets and irrigation which deterine the extent, success and profitability of diversification through high paying crop like all season vegetables. He suggested that strategy of agricultural diversification needs to be location specific.

Vishwanathan and Satyasai (1997), observed that diverse agro-climatic conditions are available in the country. There exists a high potential for production of fruits and vegetables. However, the infrastructural facilities such as processing facilities, market facilities, credit etc. are not matching with the production potential available in different states. Exploiting the available production potential through concerted efforts and maximising the use of available production through efficient post harvest handling of the produce to avoid spoilage and bringing in value addition through promotion of infrastructure are the necessary tasks for the promotion of the fruit and vegetable sector in the country.

Singhal and Gauraha (1997), suggested that for enhancing the cropped area and crop diversification in the region, emphasis must be placed on the development of micro irrigation cum water harvesting

tanks and watershed development through insitu rain conservation without hurting the environmental ecosystem.

Singh (1998), observed in his study that a number of factors influence the cultivation of fruits and vegetables. These include agro-climatic factors, land suitability, technology, scarcity of water, price fluctuations, institutional support in terms of availability of credits and inputs, infrastructural facilities like transport, cold storage etc. and scarcity of labour.

Roy (1998), highlighted that 20-40 per cent of nearly 100 million tonnes of fruits and vegetables produced annually is lost in India due to inadequate post-harvest management.

Prasad (1993), found that for small farmers, vegetable cultivation is the most profitable enterprise. He also found that the producer's share in the case of vegetables ranged from 38-72 per cent and the margins retained by the intermediaries varied from 14-49 per cent of the consumer's rupee.

Rangi and Sidhu (1998), found that vegetable growers get only 20-40 per cent of the consumer price. The middlemen have absorbed a major share without adding matching utility to the products.

Mohammad (1992), found that the vegetable cultivation has developed considerably around urban areas and is practiced by mixed castes. Crop farming was still the main occupation of high caste people in Uttar Pradesh.

Singh (1995), studied that the cultivation of vegetables was mainly practiced by a hereditary class of growers who live around cities and towns.

Lal (1998), reported that insect pest cause heavy losses in vegetable crops due to which 25-30 per cent crop yield is damaged each year.

Mani (1998), estimated that 20-40 per cent of nearly 100 million tonnes of fruits and vegetables produced annually is lost in India valued at Rs.4000-5000 crores annually due to inadequate post-harvest management.

Jakhar (1998) highlighted that about 70 per cent of Indian farmers sell their produce at the farm level to the village merchants and big producers because poor farmers are not able to bring the produce directly to market due to the non-availability of transport facilities, expensive transportation cost, malpractices in the market, non-

availability of space for farmers in the market to sell their produce etc. He also reported that out of the total production of fruits and vegetables, nearly 76 per cent is consumed in fresh form, while wastage and losses account for 20-22 per cent. Only 2 per cent of vegetable production is being processed in India, but in other developing countries like Brazil, Malaysia, Philippines and Thailand they are being processed upto 70 per cent, 83 per cent, 78 per cent and 30 per cent respectively.

Kar and Roy (1998), suggested that the government intervention is necessary to make some alternative arrangements either to collect vegetables possibly at block level from rural areas or allotting marketing space in the city to the small and marginal farmers to sell their produce directly in the city, so that, farmer's share can increase in the consumer's rupee.

Chaddha (1995), reported that to meet the requirement of the one billion population by 2000 A.D. it would be necessary to raise the vegetable production to about 100 million tonnes to supply about 200 gram of vegetables per capita per day.

2.6 Growth Performance of Productivity

Singh (1998), observed that regarding growth in yield, rate of the growth was found significant (9 per cent) except banana in Pune, orange (3 per cent) in Akola, mosambi recorded significant negative (8 per cent) growth in Pune during 1988-89 to 1994-95. But while examining the performance during 1980-81 to 1994-95, the growth rate in productivity was found significantly positive for all the crops except onion. This indicates that major improvement in productivity for fruit and vegetables took place during this period which in turn augmented the production. It is also apparent that a major breakthrough in area production and productivity of fruits and vegetables took place during the period 1980-81 to 1994-95, which is accredited mainly to horticultural development programme like establishment of nurseries and grant of capital subsidy to small and marginal farmers. The high growth in fruits has also taken place because of fruits and vegetable yields, much more than field crops.

Kaloo (1997), reported that at the time of independence, the vegetable production was 15 million tonnes and during past 50 years there has been 4-5 fold increase in its production due to development of

high yielding varieties, new production technologies, new plant protection measures and increase in the production of breeder seeds.

2.7 Marketing

Raghubansi and Tiwari (1976), reported that the producer received 30.31 per cent, 77.04 per cent and 56.22 per cent of the consumer rupee when they sold through retailer, primary wholesalers and secondary wholesalers respectively in marketing of their off season tomatoes.

Prasad (1978), reported that producer's net share in consumer's rupee was 58.30 per cent for beans, 55.20 per cent for cabbage and 58.97 per cent for brinjal. The study indicated that on an average, farmers incurred a cost of Rs.20, Rs.16.32 and Rs.15.30 for marketing a quintal of beans, cabbage and brinjal in sequence. The price spread between the retail price and net price received by the farmer at the market was in the order of Rs.0.43, Rs.0.40 and Rs.0.40 per kg of beans, cabbage and brinjal respectively.

The producer's share in consumer's price was 65 per cent. The marketing costs and margins accounted for 35 per cent, the marketing cost born by the producer came to 12.78 per cent and those of

wholesalers and retailers 11.67 per cent. The middlemen margin came to 11.67 per cent of the price paid by the consumer per tonne expenditure born by producer, the wholesaler and retailer came to Rs.57.50, Rs.30.00, Rs.22.50 respectively. The middleman share was Rs.42.50 per tonne.

Subramanyam, and Mruthyunjaya (1979), indicated that marketing costs of tomato accounted for 36 per cent of total cost. The total marketing cost varied from Rs.19.26 in *Kharif* to Rs.14.81 in *Rabi* per quintal. Commission fee constituted the bulk (37.49 per cent) in *Kharif*, whereas transport costs (30.38 per cent) had a larger share in the *Rabi*. Their sample farmers felt the need for transport arrangements to be made by the purchasing agency for picking up the produce at the field level, to enable the cultivator to save commission fee, octroi and transport changes.

Chapter - III

RESEARCH METHODOLOGY

This chapter deals with the research methodology adopted for the present study. It includes the locale of study, sampling procedure, data collection, operationalization and measurement of variables and procedure of analysis.

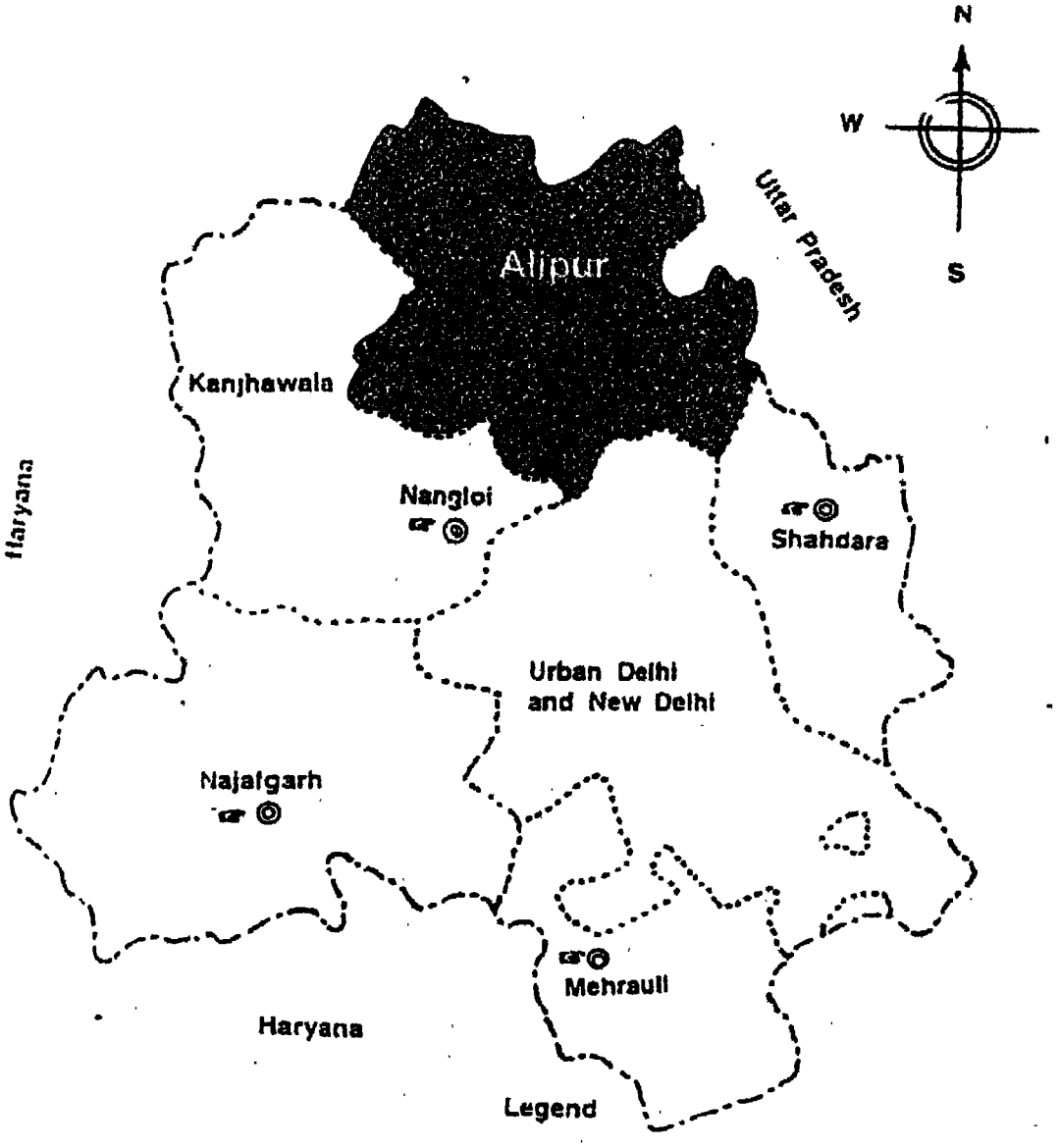
3.1 Locale of Study

This study was conducted in two villages namely, Palla and Bakhatawarpur of Alipur community development block of National Capital Territory (NCT) of Delhi where the mother dairy is in operation. This area has the maximum area (more than 60 per cent) under vegetable cultivation in the state. Thus, the Alipur block was selected purposively for carrying out this investigation. The location of the selected block is shown in Map-1.

3.2 Agro-Climatic Condition of NCT Delhi

Delhi State, predominantly an urban area, has made significant contributions to the agricultural development of the country through

Map1. Map showing selected block of Delhi state



the efforts of the Indian Agricultural Research Institute, New Delhi, the state extension agencies and progressive farmers. The contributions, not only in quantity of food produced but have also been mainly in the area of development of new technologies. Many of the new high yielding varieties of cereals, pulses and oil seeds, the precursors of green revolution, were developed and produced in this state for the first time. Village Jaunti in Kanjhawla community development block was the first seed village from where the new varieties spread to other parts of the country.

Delhi State represents a new set of farming situation which is typical of agriculture around expanding urban areas. Delhi city has already devoured large chunk of agricultural land for habitation and the farmers near the city have either sold their land or are trying to earn livelihood out of smaller pieces of land. Intensive cultivation of vegetables, fodder and other selected cash crops are carried out by the farmers. Land is a costly resource and the returns are low. Traditional crops like cereals, pulses and oil seeds are gradually giving way to cash crops. How ever, animal husbandry remains an important enterprise.

Delhi state is located between 28^0-24′-17″to 28^0-53′-0″ north latitude and 76^0-50′-24″ to 77^0-20′-37″ east longitude (Map-2). One of the smallest states in the country, Delhi, has an area of 1,483 Sq. Km.

with about 797 Sq. Km. is rural areas having 209 villages. According to census 1991, the state has a population of 94.20 lakhs of which 9.49 lakh live in rural areas. It is worth noting that there has been 109 per cent increase in the rural population since the census of 1981.

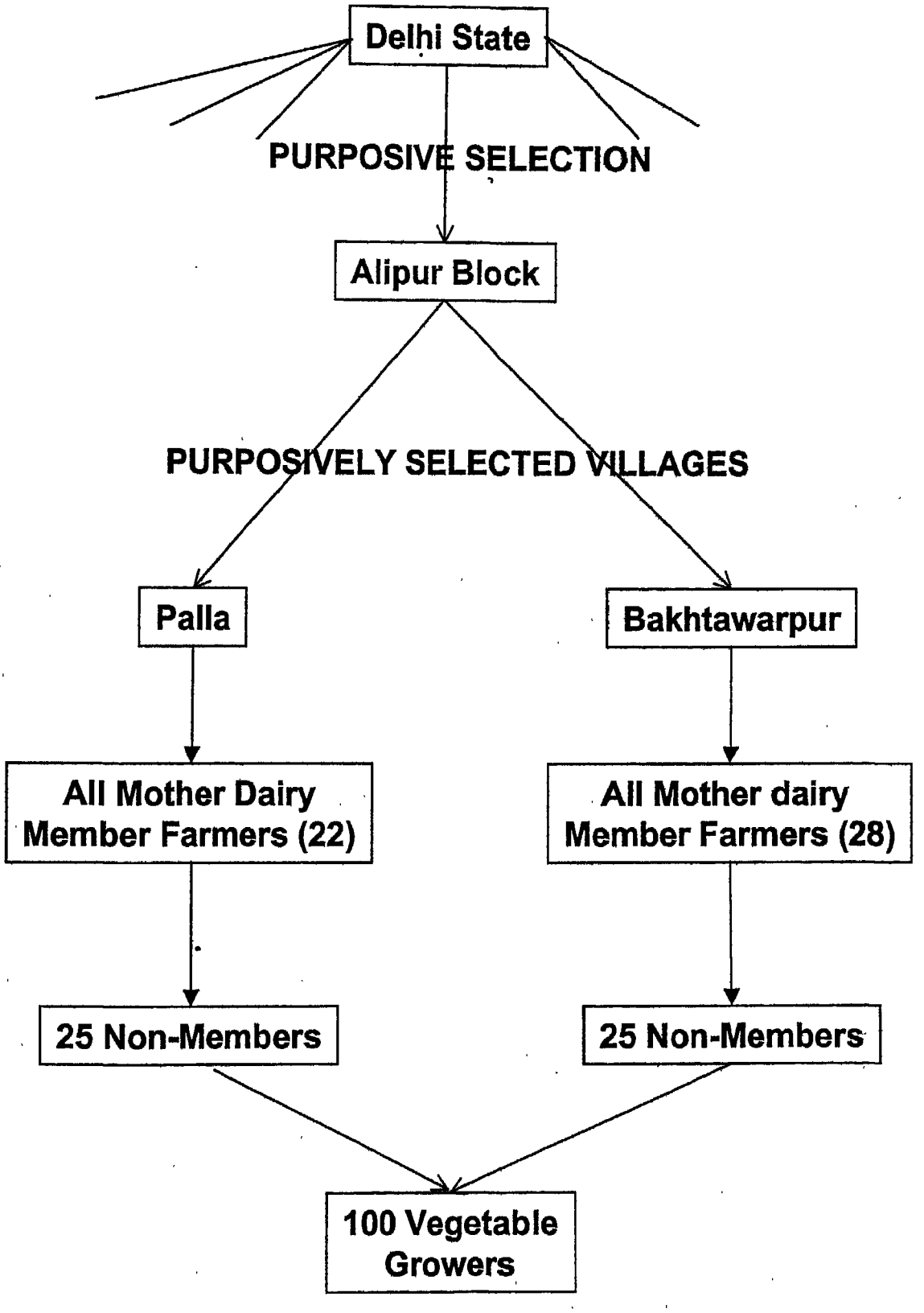
3.3 Land Utilisation

Delhi State has 1,47,488 hectares area in villages with 1191 hectares under forest. Net sown area is 46,091 hectares. Area sown more than once is 14,766 hectares. Thus, total cropped area is 60,857 hectares. There are 24,762 farmers in Delhi State including 22,885 male and 1,877 female farmers (1991 census). About 17,300 agricultural labourers support the farmers.

3.4 Climate

Delhi State has a normal rainfall of 714 m.m. with maximum rain falling in July, August and September. Mean maximum temperature varies between 21^0 C to 40^0 C and mean minimum temperature between 7^0 to 28^0 C. There are frequent dust storms in summer months and frost during winter. Net area under irrigation is 37,852 hectares, area irrigated under more than one crop is 15,901 hectares and thus, gross irrigated area is 53,753 hectares (88 per cent of the total cropped area).

Fig. 1: SAMPLING PLAN OF THE STUDY



3.5 Crops

Wheat, jowar, mustard and paddy are the important crops in the state. Farmers produce about 1.02 lakh metric tonnes of wheat on 30,396 hectares, 3,974 metric tonnes of jowar grain on 8,840 hectares and 4,196 metric tonnes of bajra on 3,096 hectares of land. Paddy is grown on 6,192 hectares of land and the production is 5,723 metric tonnes. Other crops grown are barley, gram and maize. Most of the area under wheat and paddy are irrigated. Vegetables and fruits are grown over 5,500 hectares of irrigated land.

3.6 Livestock

The bull and bullock population of over 2.5 years of age has declined from 9,569 in 1982 to 2,767 in 1987. However, there has been a rise in the total cattle population in the same period from 52,109 to 56,228. Population of buffaloes has increased from 17,760 to 2,18,515. Goat and pig population is 12,147 and 26,946 respectively. There are over 3 lakh poultry birds. Delhi cows produced 227 thousand tonnes of milk in 1991-92 and poultry birds produced 59 million eggs in the same year.

About 50 veterinary hospitals and 23 dispensaries treat over 3 lakh 27 thousand animals every year. These hospitals, etc. also provide facilities of castration, Artificial Insemination (AI), treatment for sterility and vaccination against Haemarrhagic Septicaemia (HS), Render Pest (RP) and Foot and Mouth Diseases (FMD). There are 58 private clinics, which provide health coverage to animals. These are mostly located in urban areas. As far as the supply of milk and milk product is concerned, Delhi has two major projects i.e., Delhi Milk Scheme (DMS) and Mother Dairy. In 1993, DMS was distributing 3.95 lakh litres of milk, 31 litres of butter and 387 litres of ghee every day in Delhi through its 1,347 depots. In the same year, Mother Dairy distributed about 1 lakh litres of full cream, 4.32 lakh tonnes milk every day through 396 bulk vending booths and 362 shops selling poly-pack milk.

3.7 Agricultural Implements

The agricultural implements situation clearly indicates increase in number of improved seed drills (4,964), rotary chaff-cutters (27,969) sprayers and dusters (605), tractors (2,870) and harvesters (561). There had been a reduction in the number of wooden and Iron ploughs (1,173 and 1,274 respectively) improved harrows and cultivators, carts (1,709) and irrigation pumps (oil engine 2,058 and electric engine 6,008).

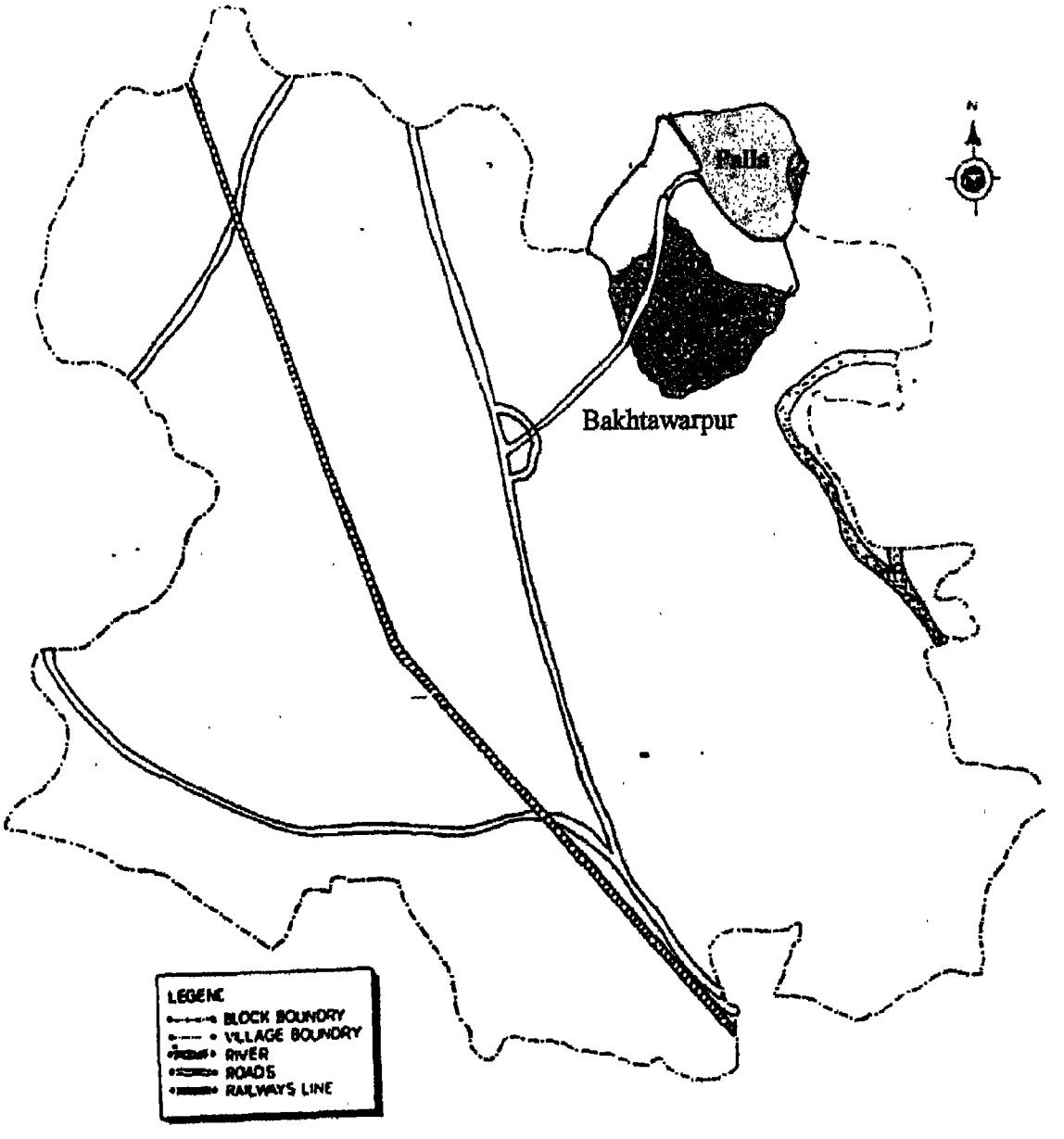
3.8 Alipur Block

Although agriculture in the traditional sense is under pressure in Delhi State, Alipur block has tremendous potential of integrated farming including crops, vegetables, animal husbandry, etc. A vast scope of introducing "hi-tech-agriculture" exists in this block which has many advantages in terms of quality of land, water and human resource.

Alipur block is located on the northern part of the National Capital Territory of Delhi and falls under the Delhi Tehsil and is about 30 kilometers from IARI, New Delhi. The total geographical area of the block is 19,993.30 hectares. The block headquarters is at Alipur village. The location of the block is highlighted in Map-2.

According to 1991 census the total population of the block was 1,79,677 comprising of 1,00,650 males and 79,027 females. The male-female ratio was 789 female per 1000 males and the density of population was 890 person per sq. km. The total population of scheduled castes was 48,441. The total number of households in the block was about 32,000. The over all literacy percentage in the block was 49.1. There are 53 villages in the block, out of which three are deserted villages. Almost all the villages are electrified and are connected with

Map 2. Map showing two selected villages of Alipur block



PUCCA roads. Transport facility in the block is quite adequate. The block is having good railway link, as a railway line passes through the block. The block is situated on the bank of river Yamuna. The block is having good number of branches of nationalised banks besides few branches of Delhi state co-operative bank. The vegetable and grain markets are about 10 kilometers from block headquarters.

The total land in Alipur block is 19,993.3 hectare out of which 14,139.0 hectares are cultivated, 1,158.9 hectares are cultivable waste and 4,965.3 hectares are not available for cultivation. Almost entire area is irrigated and the major source of irrigation is tube wells though some villages are also having canal irrigation facility.

The main crops grown in the block are Wheat, Paddy, Jowar, Tomato, Brinjal, Cauliflower, Radish, Turnip, Ladyfinger, Cucumber, Bottle Gourd, Sponge Gourd, Potato, Spinach, Marigold, Rose, Methi, Pulse and Oil Seed crops. There are many fertiliser sale depots and seed shops in the block.

3.9 Selection of Villages

There are two fruit and vegetable producers societies located at Palla and Bakhtawarpur village respectively in Alipur block. The 50

members and 50 non-member farmers of these Fruit and Vegetable Societies were selected for the investigation.

3.10 Information about Selected Villages

1. *Palla*

Palla is a medium size village having 416 families. Caste-wise, the village is dominated by Rajputs (52.40 per cent) followed by Chamars (17.06 per cent), Balmikies (10.33 per cent) and Goldsmiths (5 per cent). Other castes in the village are Brahmins, Banias, Barbars, Jogi Pottermen and Ironsmith. There is one primary school, a co-operative store, 'Nyay Panchayat Ghar', veterinary hospital, bank etc. in the village. The village is well electrified and is also having an electricity office. Some farmers are having private telephone connections.

2. *Bakhatawarpur*

Bakhatawarpur is a big size village having about 1100 families. Cast-wise, the village is dominated by Rajputs (52 per cent) followed by Jatav (20 per cent), Jat (12 per cent) and Balmikies (3 per cent). Other castes in the village are Brahmins, Banias, Barbars, Jogi, Pottermen, Teli, Sanies and Manihar. There are four primary schools (two government + two public schools), two senior secondary schools, two banks, a co-

Vegetable Collection Centre of Bakhtawarpur Village

operative society (seed & fertilizers), a post office, two medical dispensaries, sport center (MCD), a fruit and vegetable society, two poultry farms, etc. in the village. The village is well electrified and is also having an electricity office. Many farmers are having private telephone connections.

3.11 Selection of Respondents

There were two categories of respondents. The first category includes 50 members of both the Fruit and Vegetable Societies. They were interviewed with the help of a structured schedule. The second category includes 50 vegetable growers 25 from each village who were non-member of the Fruit and Vegetables Societies. They were selected randomly from Palla and Bakhtawarpur villages for this investigation. They were interviewed by using pre-tested structured interview schedule about their feelings and observations about the fruits and vegetable marketing scheme.

3.12 Measurement of Variables

An attempt was made to bring general level concept to the operational level so that it can be measured.

SOCIO-PERSONAL-ECONOMIC VARIABLES

1. *Age*

Age is considered to be one of the important factors for taking decisions about adoption of a new vegetable technology. It is because of the mental maturity and psycho-physical energy associated with age, that it plays its role in taking decisions. Thus age has been considered as one of the variables in this study. It refers to the chronological age, in terms of completed years from date of birth of the vegetable grower to the date of interview.

The vegetable growers were asked to indicate their age and number of years was taken as the score. The vegetable growers were categorised in to the following three categories.

i)	Young	=	Less than (Mean - S.D.)
ii)	Middle	=	(Mean - S.D.) to (Mean + S.D.)
iii)	Old	=	More than (Mean + S.D.)

2. *Education*

Education of respondents is one of the important factors which accelerates growth and development in vegetable production. Since farming by and large, is a family profession, all members of the family

perform various farm related tasks and so are capable of affecting improvement in vegetable farming. Educational level of the respondents is an important variable for development because they are the family heads and major decision makers. It is also important for acquisition of knowledge, comprehension and acceptance of information about vegetable cultivation.

It refers to the respondents' academic qualification acquired through school or college. It was measured with the help of the socio-economic scale developed by Trivedi (1963). The vegetable growers were categorised and assigned scores as follows:

S.No.	Item	Score
1.	Illiterate	0
2.	Can read and write	1
3.	Upto primary	2
4.	Upto middle	3
5.	High School	4
6.	Graduation	5
7.	Post graduation	6

3. *Caste*

It denotes hierarchical status conferred upon a member of a society from the time immemorial according to law of "Manu". It was

measured by direct questioning and scoring was done according to the scale developed by Trivedi (1963).

S.No.	Caste	Score
1.	Scheduled Tribe	1
2.	Scheduled Caste	2
3.	Backward Caste	3
4.	Forward Caste	4

4. Occupation

It refers to the activity, main as well as subsidiary on which the respondents rest. The main source of livelihood was asked by direct questioning. The respondents were assigned score two to vegetable cultivation as main source of livelihood and score one was given to subsidiary occupation as per procedure followed by Singh (1978).

S.No.	Occupation	Score
1.	Vegetable cultivation as main occupation	2
2.	Vegetable cultivation as subsidiary occupation	1

5. Family size

The size of family is one of the important factors influencing labour availability in a vegetable enterprise. It was measured as the total number of members residing together in one household at the time of investigation. It was further categorised as.

S.No.	Family Size	Score
1.	Small family size (Up to 3 members)	3
2.	Medium family size (Between 4 to 6 members)	2
3.	Large family size (More than 6 members)	1

6. Family type

Two types, nuclear and joint families were included in the study. The nuclear family refers to respondent as father and his wife as one conjugal pair and their children as one unit.

The joint family refers to that group of persons in which all members live together under one shed, cook and eat together and the earnings from all sources are pooled together and managed by one family head and also consist of two or more conjugal pairs.

The type of family was measured by the SES scale of Trivedi (1963) by assigning two scores to joint family and one to nuclear family system.

7. Social Participation

Social participation in any of the social organisation not only indicates one's social orientation but also provides an opportunity for the individual to have wider contact and wield greater influence in the

system which is very important for securing services and supplies necessary to achieve success in vegetable cultivation.

Social participation has been conceptualised as the respondent's participation and involvement, in informal and formal organisation as a member or office bearer. It was measured with the help of SES scale of Trivedi (1963). 1, 2, 3, scores were assigned to member of one organisation, members more than one organisation and office bearer respectively.

8. *Operational Landholding*

It refers to the actual area of land in hectares under the cultivation of the vegetable grower at the time of investigation, and also consisted of the area either leased in or leased out. It was expressed in areas. The vegetable growers were further classified in the following categories:

S.No.	Landholding	Score
1.	Landless	0
2.	Marginal landholding (upto 2.5 acres)	1
3.	Small landholding (2.6 to 5.0 acres)	2
4.	Medium landholding (5.1 to 10.0 acres)	3
5.	Large landholding (10.1 acres and above)	4

9. *Farm Machinery and Equipment Possession*

Farm implements and machineries are useful assets that aid not only in saving labour but also in increasing working efficiency at farm. In this study, the possession of farm machinery and equipment was measured in terms of quantity of items they possess and weightage was assigned to each item. Sum of assigned weightage gave the total score for the farm machinery and equipment possession. The farm material possessions were measured with the help of scale developed by Trivedi (1963) with suitable modifications. These variables were categorised into three groups based on mean and S.D.

- Less material possession = Less than (Mean – S.D.)
- Medium material possession = (Mean – S.D.) to (Mean + S.D.)
- High material possession = More than (Mean + S.D.)

10. *Total Annual Income*

It refers to the actual total income in terms of rupees of the respondents from all sources including vegetable cultivation. It was calculated by adding the income from various sources of the respondents. A schedule was developed for this purpose. The respondents were categorised into 3 groups depending on their annual income.

- Low income (up to Rs. 15,000)
- Medium income (between Rs. 15,001 to 65,000)
- High income (above Rs. 65,000)

11. *Means of Transport*

Access to transport in rural areas is an added advantage to the farmers as they have to make frequent visits to farm and market either to carry farm produce or required input and material. They can conveniently use it as and when required and save much time.

It was operationalised as the possession of transport means used by the respondent for carrying vegetables for sale. All the means of transport were quantified as follows:

Item	Score
• Bicycle	1
• Cycle-rikshaw	2
• Three-wheeler	3
• Car/Jeep	4
• Bullock-cart	5
• Tractor-trailor	6
• Truck/Tempo	7

To obtain the total score of transport means the scores of item was more than one, the score was multiplied by the number of a particular item.

12. *Sources of Irrigation*

Irrigation is one of the basic infrastructures for vegetable production. The proportion of irrigated land at a farm largely influences its organisation and production. It refers to the sources utilised by the respondents for irrigation of vegetable crops.

PSYCHOLOGICAL VARIABLES

13. *Knowledge of Vegetable Production Technology*

Knowledge is an important component needed for a vegetable grower for proper utilisation of available human and material resources. Hence, it is imperative to measure the knowledge level of vegetable technology of the farmers.

The knowledge of the vegetable production technology was operationalised as the extent to which the recommendations pertaining to vegetable technologies are known to the vegetable growers. The scoring procedure developed by Kaushal (1983) was used in this study with some modifications. There were 15 items in the scale. Each correct

response to the item was given a score of one while, the incorrect response was given no score. Thus, the maximum possible obtainable score of the test was 15, whereas the minimum was zero.

14. Risk Orientation

No risk, no gain is an old addage. Risk taking willingness is an important characteristic of innovative farmers. Risk orientation enables a farmer to derive maximum benefits from the available technologies. It is conceptualised as the degree to which a vegetable grower is oriented towards risk and uncertainty and has courage to take risk and face the problems in vegetable cultivation. It was measured by using the 5 statements standardised by Supe (1969) with some modifications. The scale consisted of five items on five points continuum ranging from very little risk to very much risk in vegetable crops. The expected score of risk orientation ranged from 5 to 25. The respondents were categorised in to the following 3 categories.

- Low risk (Up to 10per cent)
- Medium risk (Between 10-30 per cent)
- High risk (More than 30 per cent)

COMMUNICATION VARIABLES

15. Extension Contact

It refers to both the frequencies of contacts with extension personnel, Village Development Officer (VDO). Agricultural Extension Officer (AEO), Block Development Officer (BDO), District Horticulture Officer (DHO), Horticulture Specialist of Mother Dairy (HSMD) and Agricultural Scientists of IARI. Frequency of contact with extension personnel was measured through a schedule developed for this purpose on four point continuum viz., Frequently (more than 6 times), Often (4 to 6 times), Seldom (1 to 3 times), Never (0) with respective score of 3, 2, 1, and 0 as given in Appendix-I. These contacts were, thus, proposed to give maximum expected score of 36 and the minimum could be zero. Farmers were categorised into 3 groups.

i) Low extension contact = Less than (Mean – S.D.)

ii) Medium extension contact = (Mean – S.D.) to (Mean + S.D.)

iii) High extension contact = More than (Mean + S.D.)

16. Exposure to Mass Media

How far the farmers are exposed to mass media like Films, Radio, T.V., Written Material, Farmers Fair, Agriculture Exhibition, Vegetable

Show, Farmers' Day, Vegetable Crop Demonstrations, Meetings, Farmers Conducted Tours, Training Courses on Vegetables, and Mother Dairy etc. The frequency of exposure with mass media was measured through a schedule developed for this purpose on four points continuum as discussed above with measurement of variable extension contacts. Thus the proposed score ranged between zero to 27 (Appendix-I).

17. Infrastructure Facilities Utilisation

An entrepreneur in his venture to set up a unit requires a variety of assistance such as information, raw materials, market etc. The strength and co-ordination of the support system form the backbone of any entrepreneur's efforts and success. An index was developed exclusively for studying this variable based on the accessibility to the available infrastructure in the study area (Appendix-I). The total score was computed for each individual by adding the score assigned to different categories (Appendix-I). Each item in the index was provided with its response categories, i.e., total satisfaction, partial satisfaction and no satisfaction. The scores were given 3, 2, and 1 respectively. There were 27 statements in the index. The maximum possible obtainable score was 81, whereas, the minimum was twenty seven.

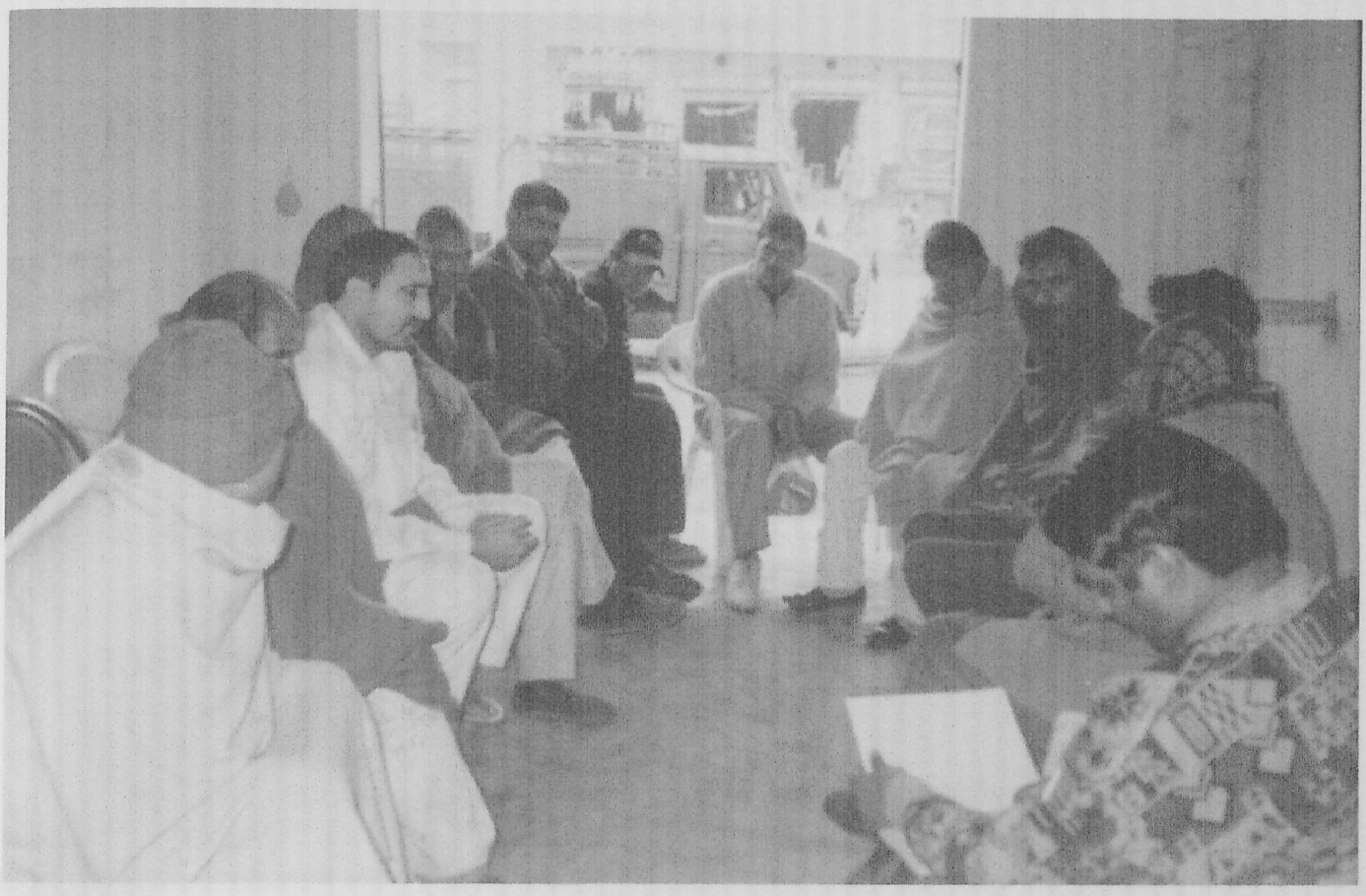
3.13 Tools and Techniques for Data Collection

An exhaustive schedule was developed to collect the data from the respondents. While constructing the interview schedule, the objectives of the study were taken into consideration and statements were made based on the experiences, discussion with the experts and review of relevant literature. The schedule was pre-tested in the Institute Village Linkage Programme (IVLP) villages of IARI, in Alipur block of Delhi. On the basis of pre-testing, necessary modifications were made and the final schedule was prepared for data collection. The copy of the schedule is appended in Appendix-I. The respondents were personally interviewed with the help of structured schedule.

Before starting data collection, rapport was established with the field extension personnel and farmers in the selected villages.

The background information about the sample villages were obtained from block office records and reports available at block headquarters. The interview schedule of farmers was filled in personally by the investigator after interviewing the respondents. The data collection work was done from December, 1998 to January, 1999.

Group Meeting at Palla Village



Group Meeting at Bakhtawarpur Village

3.14 Data Collection

The data on the pre-structured and pre-tested schedule were collected from all the member and non-member vegetable growers of mother dairy of the study area. The data so collected, were coded, tabulated and used for statistical analysis.

3.15 Analysis of Data

The data so collected were tabulated and suitably analysed in the light of objectives. For drawing inferences, the various statistical tests used or descriptive (Percentage, Mean, SD etc.) correlation. The analysed data were interpreted and presented with the help of tables, diagram/graphs etc. in the next chapter i.e. Result and Discussion.

Chapter - IV

RESULTS AND DISCUSSION

The results are presented in four parts as per the objectives of the study. Under objective number one, 20 socio-economic variables were analysed using descriptive statistics (Frequencies, percentage, standard deviation, mean etc.). In presence of objective number two, socio-economic and infrastructural correlates of commercialization of vegetable cultivation were found out. Under the third objective, the factors promoting farmer's participation in the institutionalized intervention was assessed through participatory techniques. Under objective number four, the views and suggestions to improve commercialization of vegetable cultivation were analysed. The data of the study are presented in (1-22) tables and bar diagrams were used to make visual presentation of some of the data.

Socio-Economic Profile of the Vegetable Growers

1. Age

Data collected for age have been presented in Table-1.

Table-1: Distribution of vegetable growers according to their age

N=50

Age	Frequency	Percentage
1. Young (upto 30)	5	10
2. Middle (31-45)	28	56
3. Old (above 46)	17	34
Total	50	100

Majority of vegetable growers belonged to the middle age group (56 per cent) followed by old age groups (34 per cent) and young age group (10 per cent). It is evident from the table that middle aged farmers are more skilled and experienced in vegetable production technology.

2. *Education*

The data collected regarding educational level of vegetable growers are reported in Table-2.

Table-2: Distribution of vegetable growers according to their education

N=50

Level of Education	Frequency	Percentage
1. Illiterate	0	0
2. Can read only	0	0
3. Can read and write	0	0
4. Primary	2	4
5. Middle school	4	8
6. Secondary	30	60
7. Graduation	11	22
8. Post graduation	3	6
Total	50	100

Fig. 2: Distribution of vegetable growers according to their Age

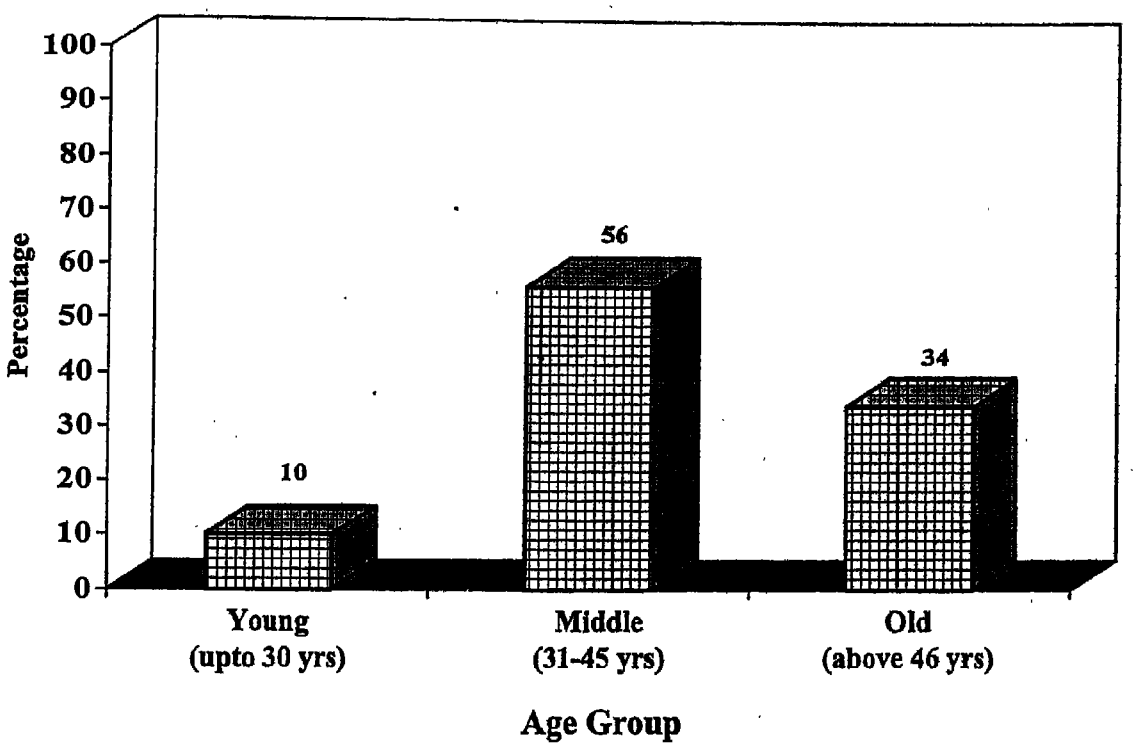
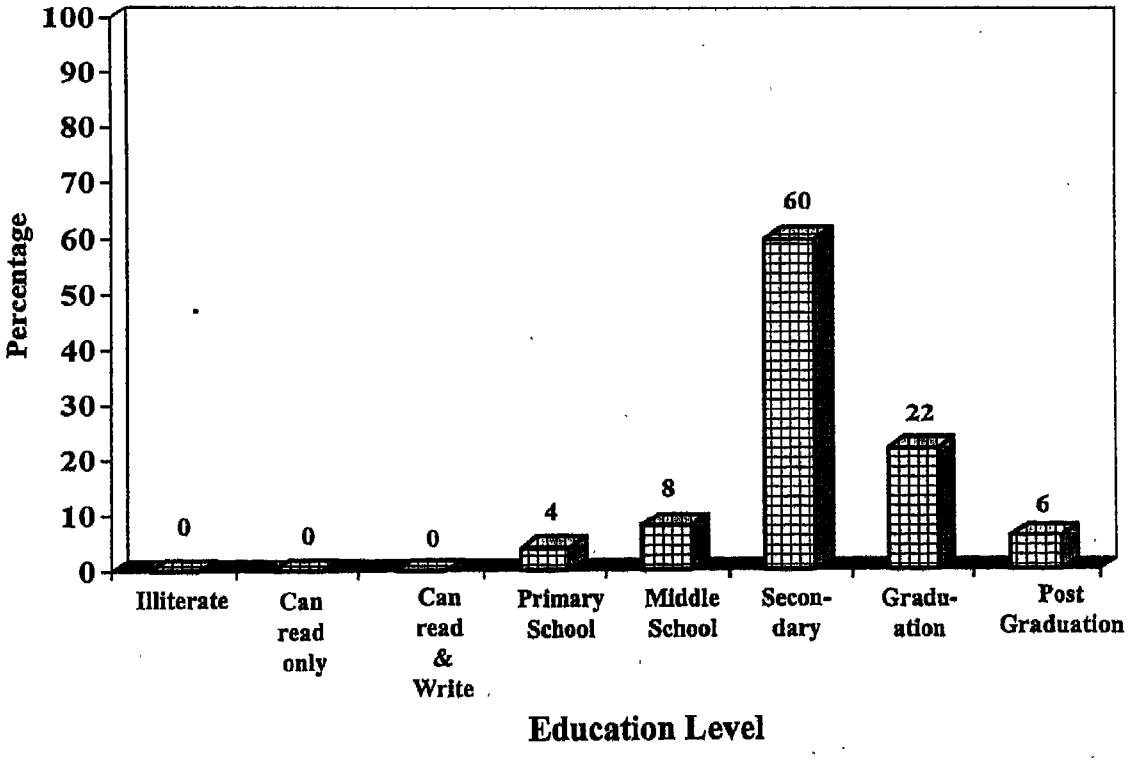


Fig. 3: Distribution of vegetable growers according to their Education



The data reported in Table-2 reveal that 60 per cent vegetable growers had schooling upto secondary level, 22 per cent upto graduate level and 6 per cent upto post graduate level. The average education score was found to be 5.24 out of the highest possible score of 6. This clearly indicates that the educational level of the vegetable growers was quite good. This is a positive trend. It indicates that print media can be easily utilised for their vegetable cultivation training. Use of transparencies, leaflets, magazines and even computers can be used for their training.

3. *Caste*

In rural India, caste still seems to hold significance. The social stratification in terms of caste of the selected farmers is shown in Table-3.

Table-3: Distribution of vegetable growers according to their caste

N=50

Caste	Frequency	Percentage
1. Scheduled caste	0	0
2. Backward çaste	0	0
3. General caste	50	100
Total	50	100

It is evident from Table-3 that all respondents belonged to forward caste. It is worth noting that in the selected villages, majority of the other caste members were landless hence they do not cultivate vegetables.

Fig. 4: Distribution of vegetable growers according to their Caste

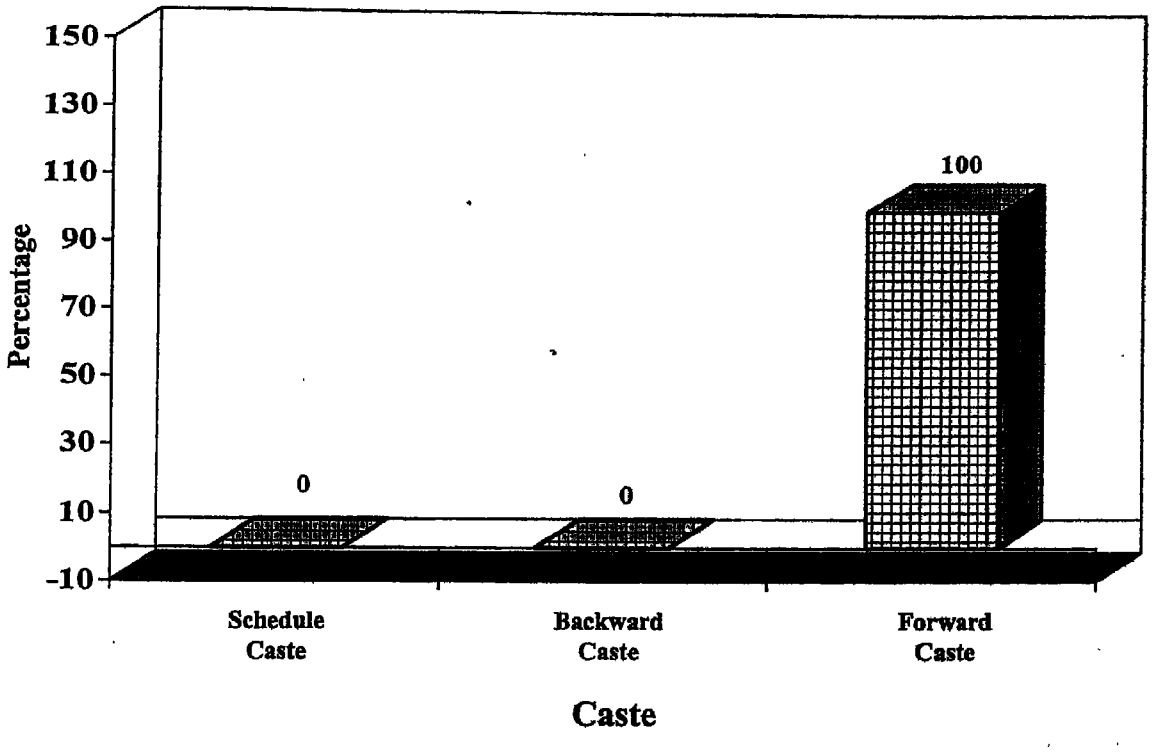
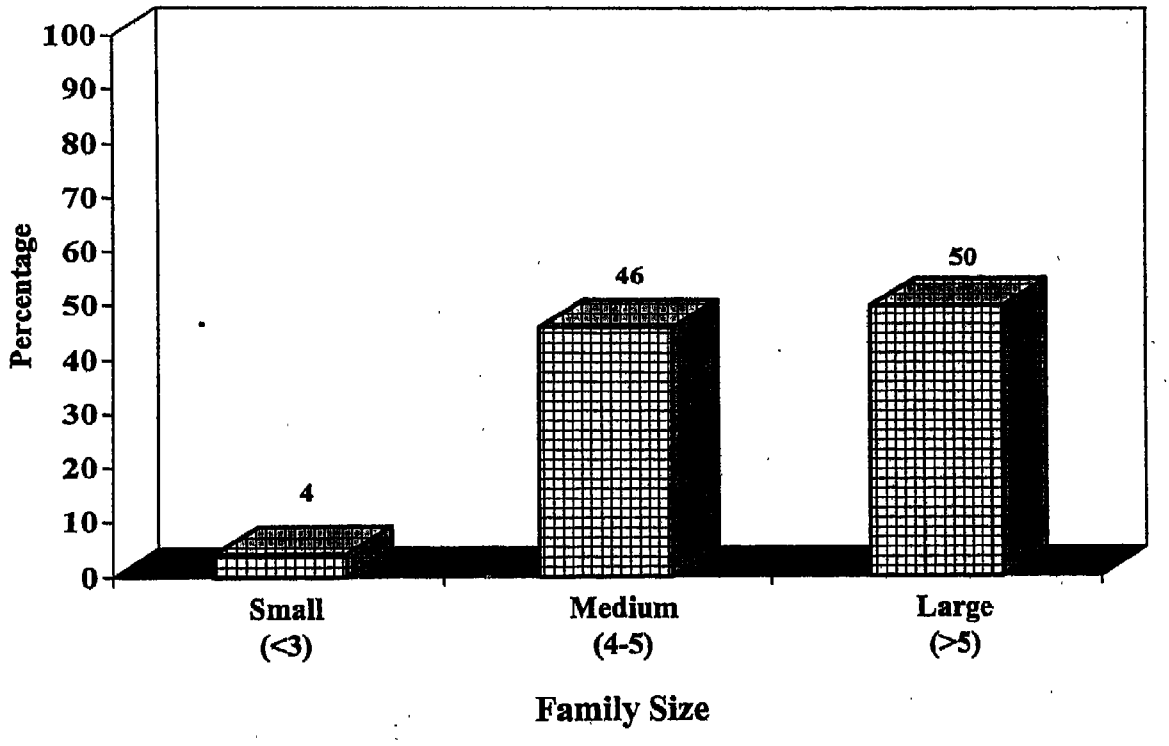


Fig. 5: Distribution of vegetable growers according to their Family Size



4. Family Size

Table-4 shows that 4 per cent of the respondents had less than 3 members in their family. Half of the respondents i.e. 50 per cent were having more than 5 members in their family, whereas 23 respondents (46 per cent) were having 4 to 5 members in their family.

Table-4: Distribution of vegetable growers according to their family size

N=50

Categories	Frequency	Percentage
1. Small (< 3)	02	4
2. Medium (4 to 5)	23	46
3. Large (>5)	25	50
Total	50	100

About 96 per cent of the vegetable growers had medium and large families. This could be because vegetable cultivation is labour intensive, only large and medium families, who had enough family labour force could afford to go for vegetable cultivation. For small size families, due to lack of family labour, only few of them were cultivating vegetables. Such families used to hire labour for different activities of vegetable cultivation.

5. Family type

The respondents belonged to both nuclear and joint families. It is interesting to note that in the area of investigation, joint family system

dominates. Seventy per cent of the vegetable growers came from joint families whereas 30 per cent of them belonged to nuclear families. It may be mentioned here that in a labour intensive enterprise like vegetable cultivation, joint family system is a boon since it has more manpower to perform various tasks of vegetable cultivation.

Table-5: Distribution of vegetable growers according to their family type

N=50

Family type	Frequency	Percentage
1. Nuclear families	15	30
2. Joint families	35	70
Total	50	100

6. Occupation

As reported in Table-6, about 98 per cent of the vegetable growers had vegetable cultivation as their mainstay. They used to get more than 50 per cent of their earning from vegetable cultivation. However, only 2 per cent of the vegetable growers had vegetable cultivation as their subsidiary occupation. In their case, major family income was coming from occupations like service, business etc.

Fig. 6: Distribution of vegetable growers according to their Family Type

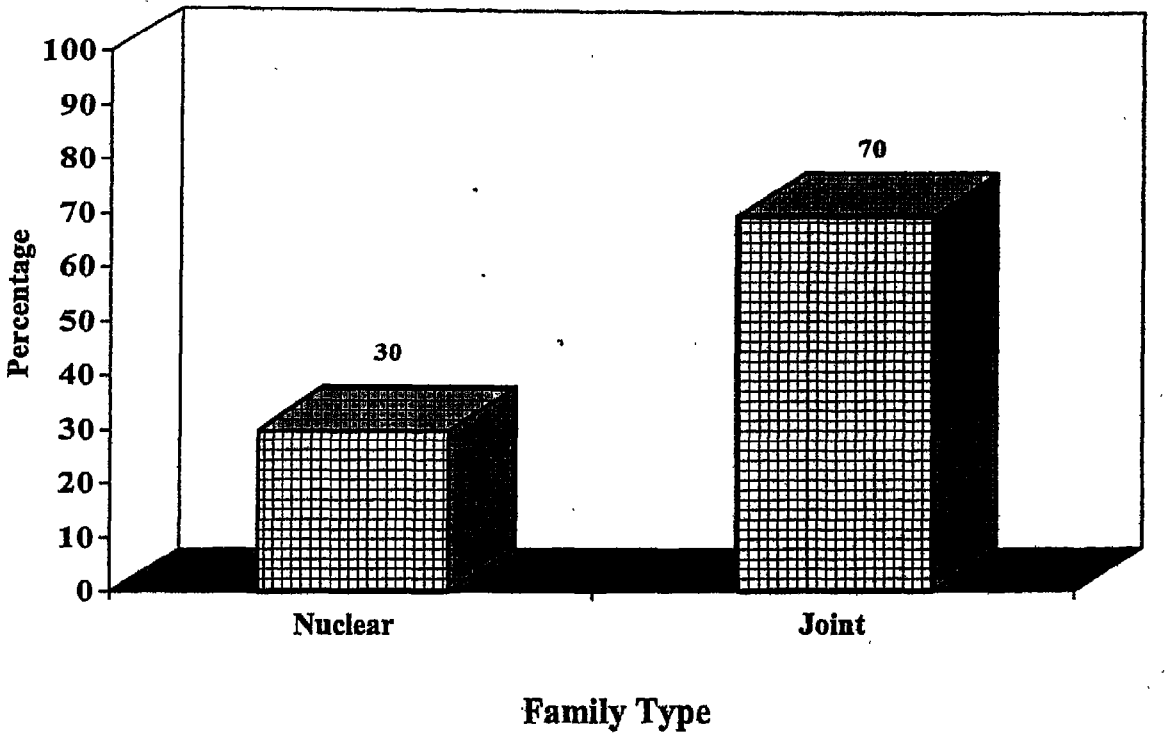


Fig. 7: Distribution of vegetable growers according to their Occupation

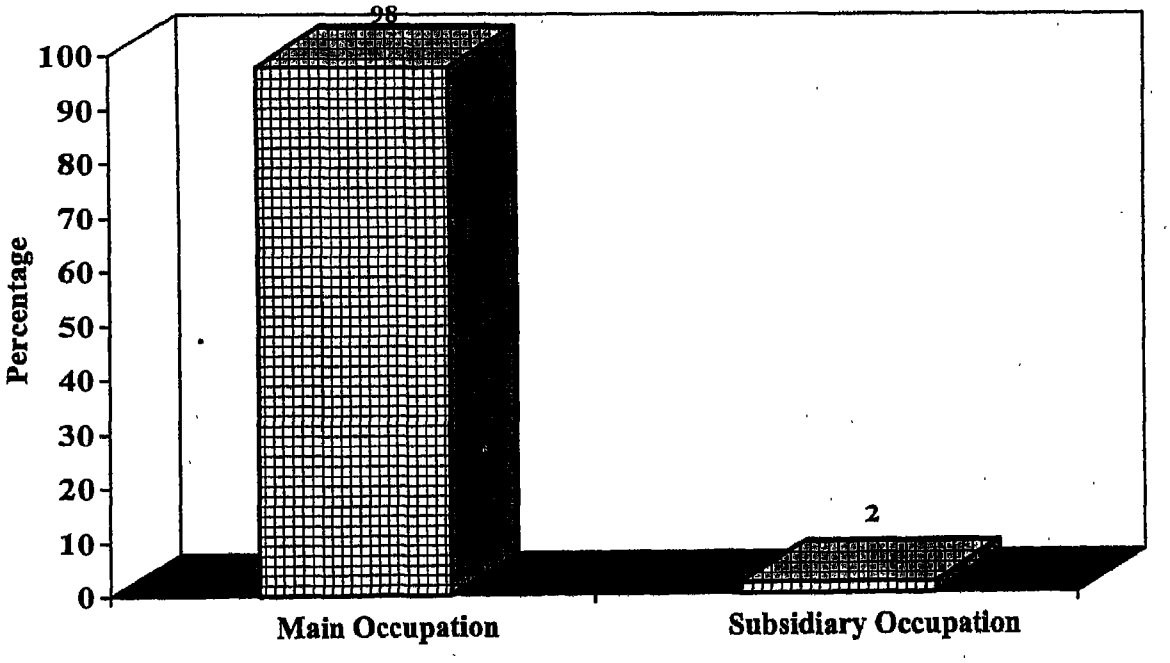


Table-6: Distribution of vegetable growers according to their occupation

N=50

Occupation	Frequency	Percentage
1. Vegetable cultivation as main occupation	49	98
2. Vegetable cultivation as subsidiary occupation	1	2
Total	50	100

It is worth mentioning here that Alipur is predominantly agriculture based block with main focus on vegetable cultivation. The chief reasons being availability of irrigation and marketing facilities in these villages. All these factors resulted in preference for vegetable cultivation in this area.

7. *Social Participation*

The data regarding social participation of vegetable growers is presented in Table-7.

Table-7: Distribution of vegetable growers according to their social participation

N=50

Social participation	Frequency	Percentage
1. Member of one organization	44	88
2. Member of more than one organization	2	4
3. Office bearer	4	8
Total	50	100

The village organisations prevalent in the area are village panchayat, agricultural co-operative societies, fruit and vegetable society, religious committee, milk co-operative society etc. of which the respondents were members or office bearers. All the respondents were the members of fruit and vegetable society of Mother Dairy. Two respondents were members of more than one organisation. Four respondents were found to be office bearers in different organisations. This shows that they had opportunity to share information and ideas through fruit and vegetable society of Mother Dairy. They also derived other benefits.

8. Operational Land Holding

Based on the land holding, the vegetable growers were classified into 4 categories – marginal farmers (upto 2.5 acres), small farmers (2.51 to 5.00 acres), medium farmers (5.01 to 10.00 acres) and big farmers (above 10.00 acres). The data collected regarding this variable are reported in Table-8.

It is seen that small (40 per cent) and marginal farmers (38 per cent) dominated the vegetable growing. It was observed during data collection that though many farmers were holding more than 10 acres of land, they

Fig. 8: Distribution of vegetable growers according to their Social Participation

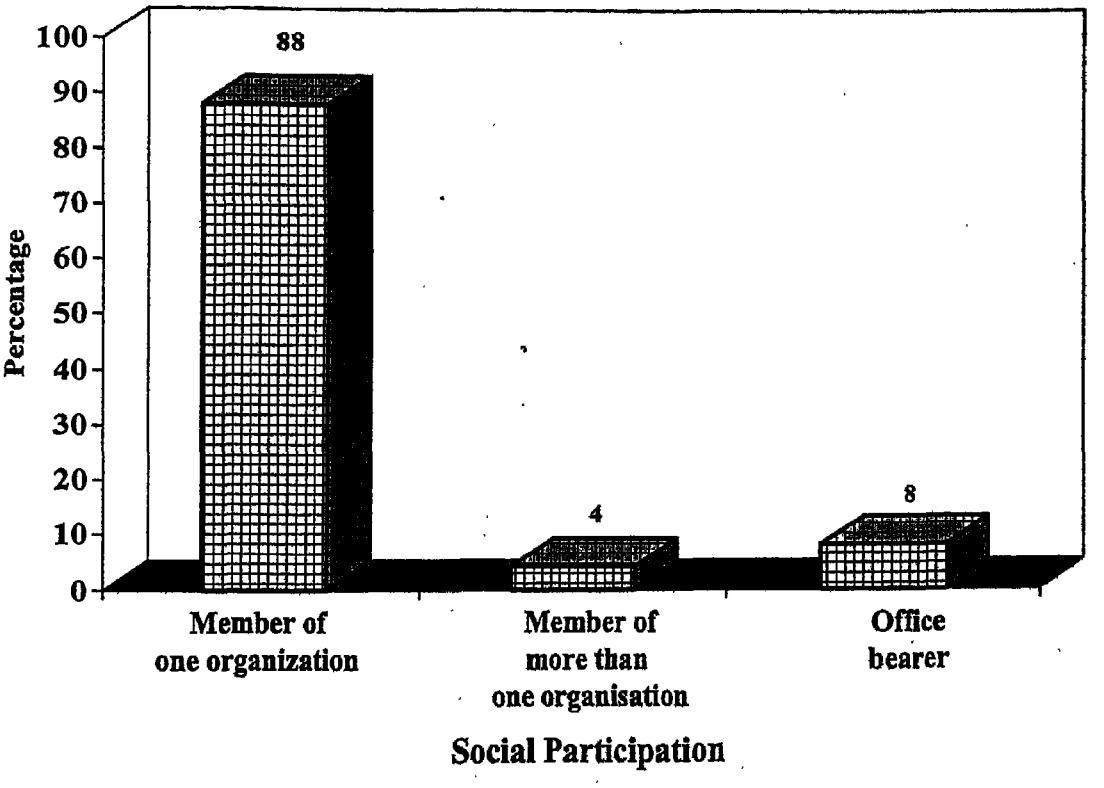
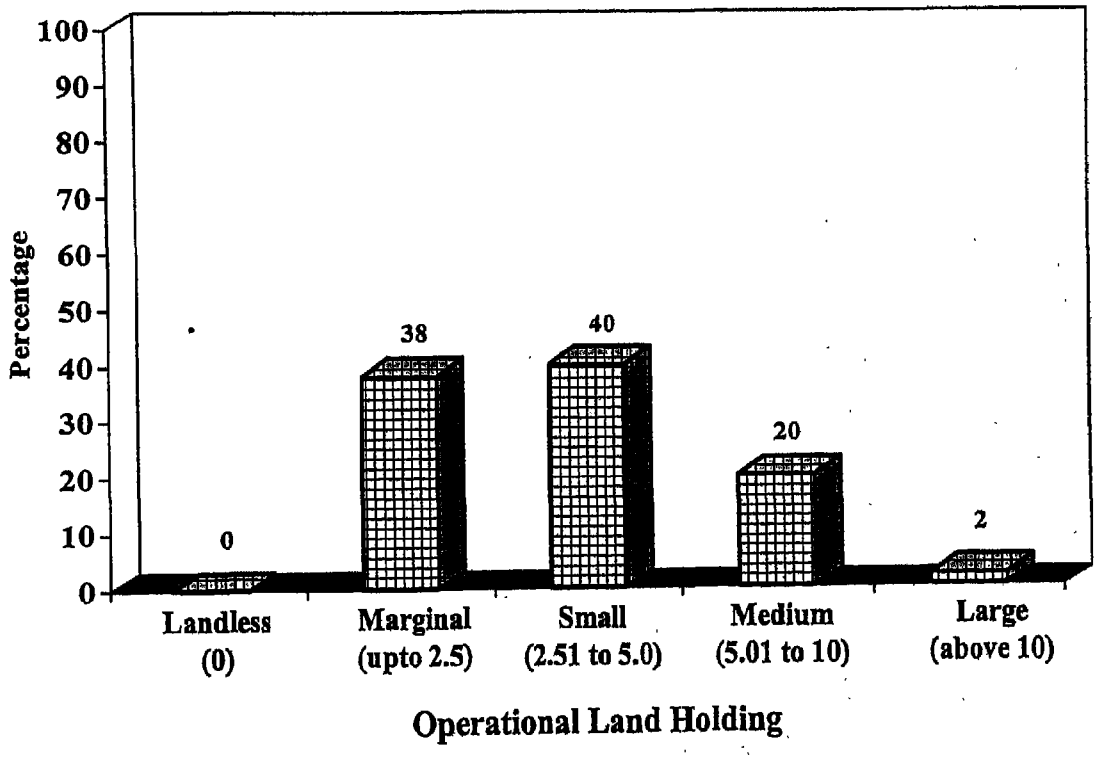


Fig. 9: Distribution of vegetable growers according to their Land Holding (Acre)



were not cultivating vegetable in the entire land due to its nature of being labour intensive and more expensive enterprise.

Table-8: Distribution of vegetable growers by their operational land holding

N=50

Land holding (Acre) categories	Frequency	Percentage
1. Land less (0)	0	0
2. Marginal (upto 2.5)	19	38
3. Small (2.51 to 5.0)	20	40
4. Medium (5.01 to 10.0)	10	20
5. Large (above 10.0)	1	2
Total	50	100

The medium and big farmers continue growing vegetable crops in part of their holdings to meet their own consumption need. The farmers mentioned that, in general, they were not prepared to put all their eggs in one basket particularly in view of the risk involved in vegetable cultivation. The nature of vegetable cultivation on commercial scale being highly labour intensive and expensive, the farmers, in general were not able to manage vegetable cultivation on a large scale hence they continued vegetable cultivation in only a part of their holdings. In addition, before the introduction of fruit and vegetable society, there was no proper marketing facility in this area.

Fig. 10: Distribution of vegetable growers according by their Farm Machinery and Equipment Possession

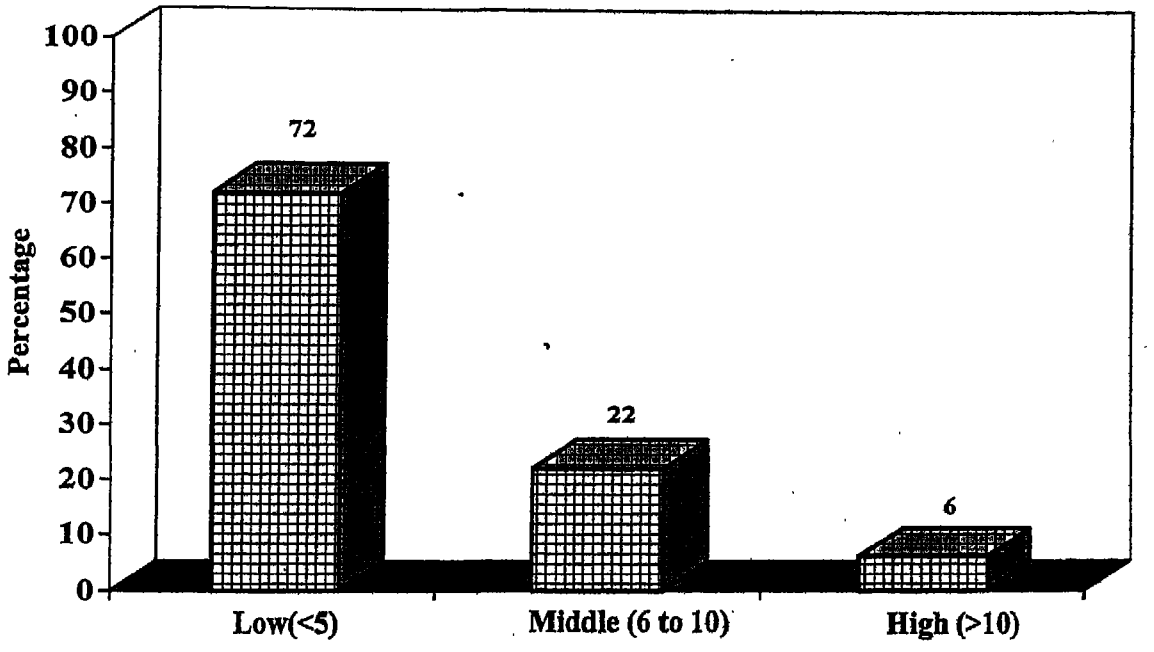
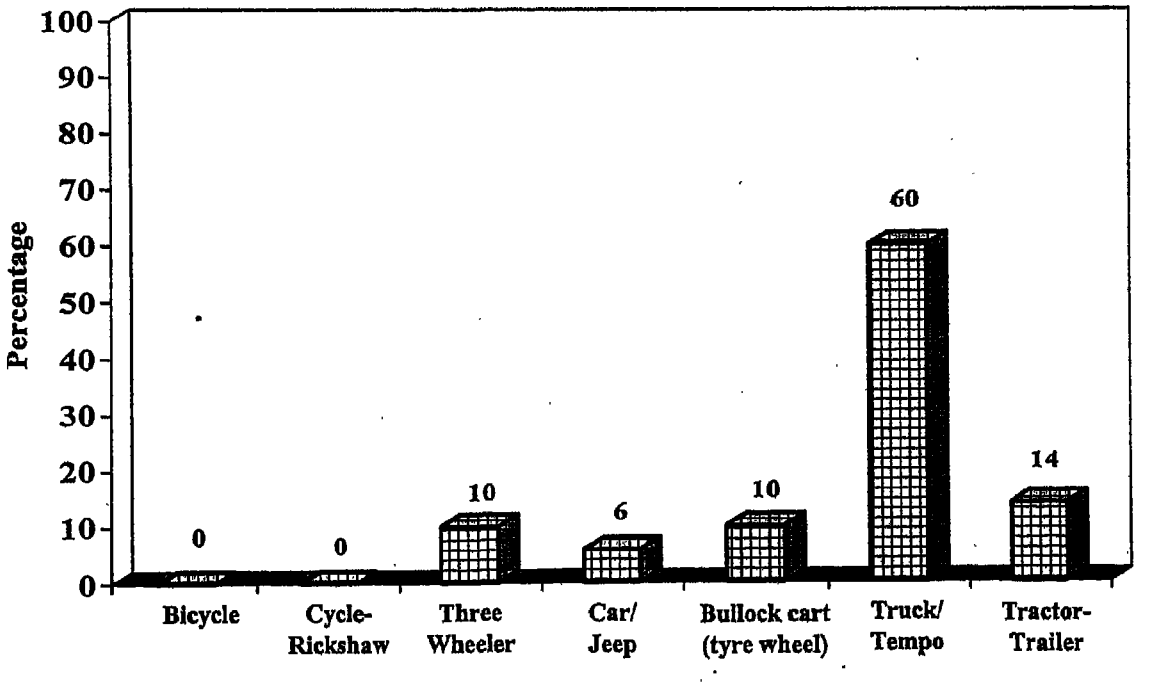


Fig. 11: Distribution of vegetable growers according to their Means of Transport



9. *Farm Machinery and Equipment Possession*

The distribution of farm machinery and equipment possession per farmer is presented in Table-9. It reveals that about 72 per cent of the vegetable growers had low level of farm machinery and equipment of less than 5 number. The next group of farmers (22 per cent) had medium level of machinery possession between 6 to 10 numbers. Only 6 per cent of farmers had more than 10 farm machinery and equipments. This shows that there is a heavy dependence on manual labour for vegetable cultivation. There is a dearth of technology and equipment for vegetable cultivation. Agricultural Engineers and Researchers should look into the matter.

Table-9: Distribution of vegetable growers by their farm machinery and equipment possession

N=50

Farm machinery and equipment possession	Frequency	Percentage
1. Low (< 5)	36	72
2. Middle (6 to 10)	11	22
3. High (> 10)	3	6
Total	50	100

10. Means of Transportation

Sixty per cent farmers were commonly observed to hire truck/tempo for transportation of vegetables followed by tractor trailer (14 per cent), bullock cart (tyre wheel, 10 per cent), three wheeler (10 per cent) and only six per cent car or jeep. It was observed that there is no problem of transport in the area for carrying vegetable to the market (mandi), because these villages are very close to Delhi city. There are a number of three wheeler scooters, small trucks available in the village itself. Earlier the number of bullock carts were many but the number is reducing slowly. However, automobiles are increasing in resent years. So, there was no problem of transportation of vegetable to the market in the area.

Table-10: Distribution of vegetable growers according to their utilization of means of transport for carrying vegetables for sale

N=50

Means of Transport	Score	Frequency	Percentage
1. Bicycle	1	0	0
2. Cycle-Rickshaw	2	0	0
3. Three Wheeler	3	5	10
4. Car/Jeep	4	3	6
5. Bullock Cart (Tyre wheel)	5	5	10
6. Truck/Tempo	6	30	60
7. Tractor-Trailer	7	7	14
Total		50	100

Fig. 12: Distribution of vegetable growers according to their Sources of Irrigation

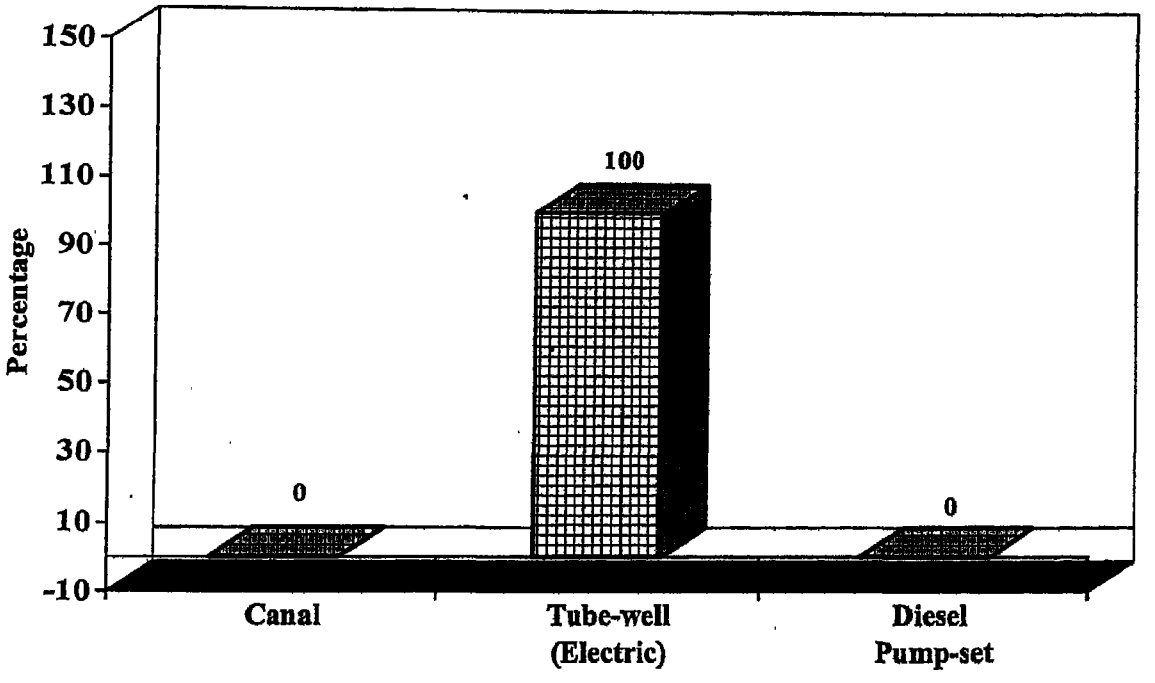
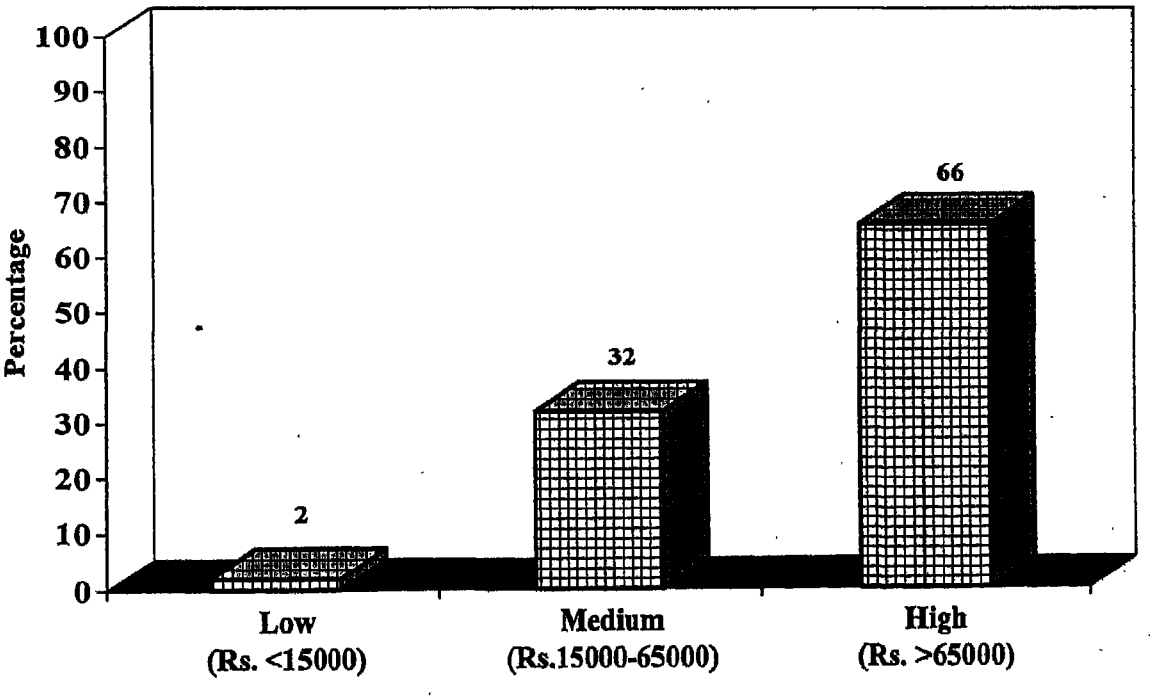


Fig. 13: Distribution of vegetable growers according by their Net Income from Vegetable



11. *Source of Irrigation*

Source of irrigation and assured irrigation in one of the most important factor for vegetable cultivation. Because vegetables used to be very tenders crop and requires frequent irrigation. It can be observed from the Table-11 that 100 per cent farmers were having tube wells for irrigation of vegetable crops so that they can earn more income from it.

Table-11: Distribution of vegetable growers according to their sources of irrigation

N=50

Source of Irrigation	Frequency	Percentage
1. Canal	0	0
2. Tube Well (Electric)	50	100
3. Diesel Pump-set	0	0
Total	50	100

12. *Net Income from Vegetables*

The net income from the vegetables is categorized in three categories i.e. low income (Rs. <15,000), middle income (Rs. 15,000-65,000) and high income (Rs. >65,000). The distribution of respondents by their net annual income from vegetable cultivation is presented in Table-12. Majority of the vegetable growers (66 per cent) were found to have high vegetable income. Only two per cent of the vegetable growers had low

level of vegetable income, whereas 32 per cent of them had medium level of annual income. Since the vegetables are cultivated commercially, very few vegetable growers were found in low income level. Almost 98 per cent of the vegetable growers were having either medium or high level of income. It can be concluded that vegetable cultivation had boosted the income level of the farmers in this area. In other words, the vegetable cultivation was a viable income raising enterprise in this area.

Table-12: Distribution of vegetable growers by their net income from vegetables

N=50

Income	Frequency	Percentage
1. Low (Rs. < 15000)	1	2
2. Middle (Rs. 15000-65000)	16	32
3. High (Rs. > 65000)	33	66
Total	50	100

13. *Extension Contact*

The extension contact of the respondents was categorized into three categories i.e. low (<12), medium (12.14) and high (>14). The frequency and percentages are presented in Table-13. From Table-13, it is evident that about one-third of the respondents i.e. 56 per cent were having medium level of extension contacts. The respondents having low and

high-level extension contacts were found to be 20 and 24 per cent respectively. It was encouraging sign that majority of the farmers were consulting Center for Agricultural Technology Assessment and Transfer (CATAT) officials of IARI regarding agricultural related issues, because CATAT has opened its offices in these villages.

Table-13: Distribution of vegetable growers by their extension contact

N=50

Extension Contact	Frequency	Percentage
1. Low (< 12)	10	20
2. Medium (12-14)	28	56
3. High (Above 14)	12	24
Total	50	100

14. *Mass Media Exposure*

The mass-media exposure is presented in Table-14. It was found that majority of the respondents (70 per cent) were having medium level of mass media exposure. It may be inferred from this table that more than 94 per cent respondents are exposed to mass media from medium to high level. It may be because these villages are well connected by road with Delhi and also not very far from the national capital.

Fig. 14: Distribution of vegetable growers according to their Extension Contact

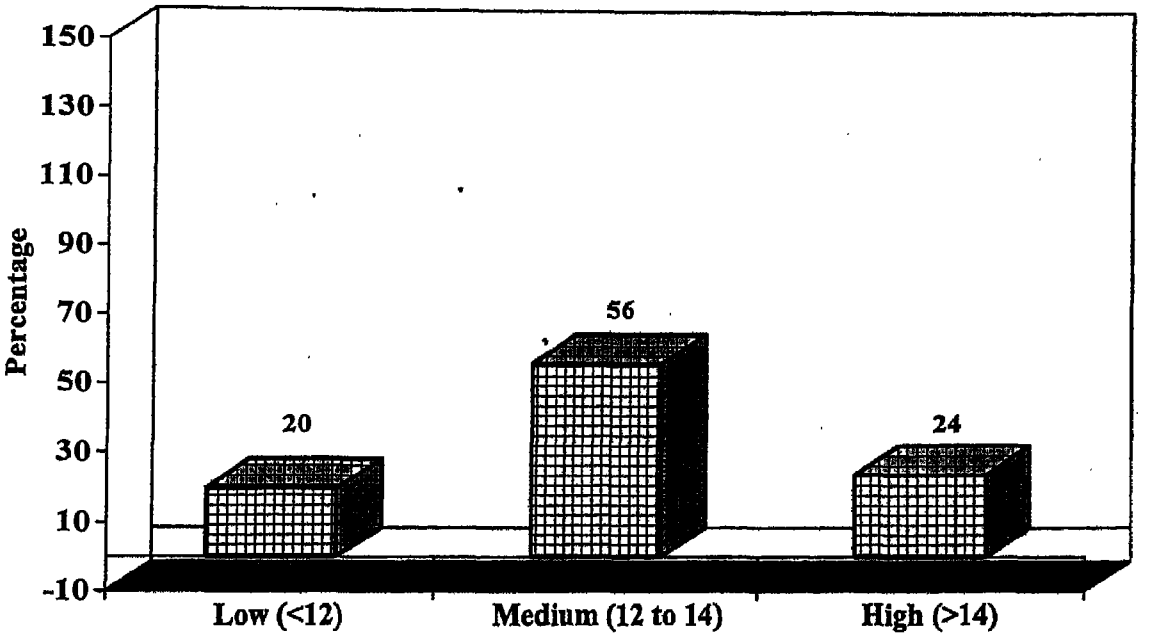


Fig. 15: Distribution of vegetable growers according by their Mass Media Exposure

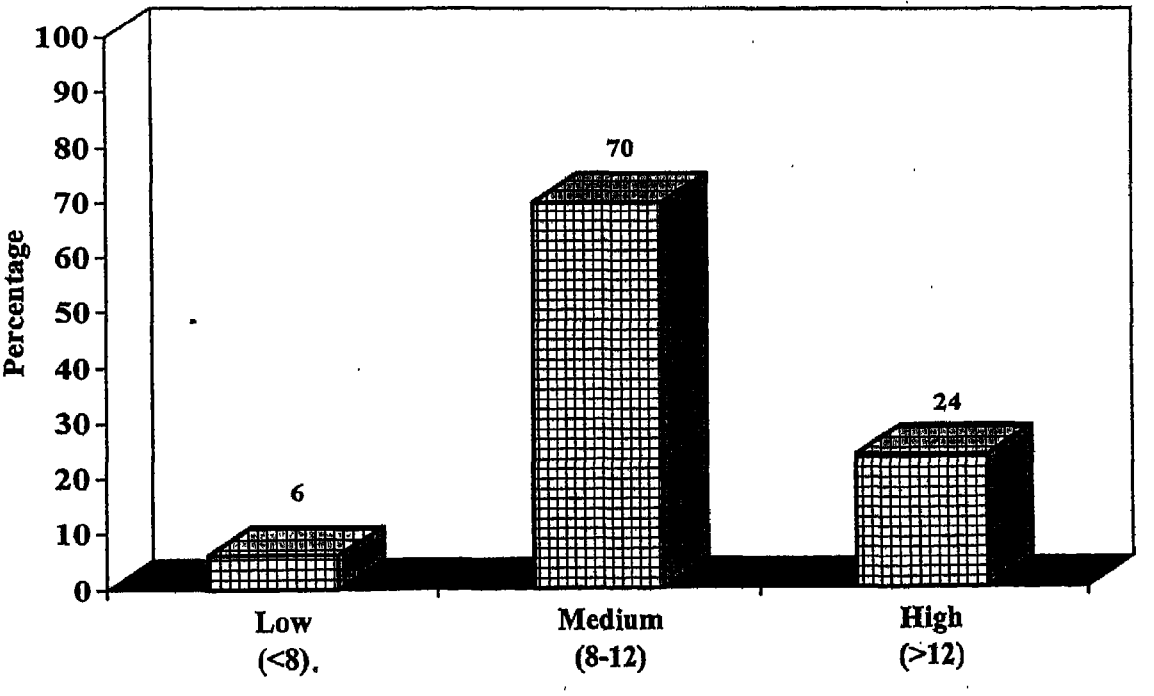


Table-14: Distribution of vegetable growers by their mass media exposure

N=50

Exposure to mass media	Frequency	Percentage
1. Low (< 8)	3	6
2. Medium (8-12)	35	70
3. High (> 12)	12	24
Total	50	100

15. Risk Orientation

Distribution of vegetable growers by risk orientation is presented in Table-15. The result presented in Table-15 shows that 24 per cent farmers had low level of risk orientation. But about 64 per cent of the vegetable growers were having medium level of risk orientation for vegetable cultivation, only 12 per cent vegetable growers were having high level of risk orientation for vegetable cultivation. The lower percentage of the vegetable farmers under high level of risk orientation category is an alarming fact, as it is evident that more than 88 per cent respondents were having low or medium level of risk orientation about the vegetable cultivation. It may be inferred from this finding that the majority of the vegetable growers are not having much risk taking willingness about vegetable cultivation. Special attention is needed to enhance the risk

taking willingness of the remaining farmers to improve the commercialization of vegetable cultivation.

Table-15: Distribution of vegetable growers by their risk orientation

N=50

Risk Orientation	Frequency	Percentage
1. Low (Upto 10 per cent)	12	24
2. Middle (10-30 per cent)	32	64
3. High (> 30 per cent)	6	12
Total	50	100

16. *Knowledge of Vegetable Production Technology*

The distribution of vegetable growers by knowledge of vegetable production technology is presented in Table-16.

Table-16: Distribution of vegetable growers according to their knowledge of vegetable production technology

N=50

Knowledge of Vegetable Technology	Frequency	Percentage
1. Low (< 90)	6	12
2. Middle (90-100)	25	50
3. High (> 100)	19	38
Total	50	100

Fig. 16: Distribution of vegetable growers according to their Risk Orientation

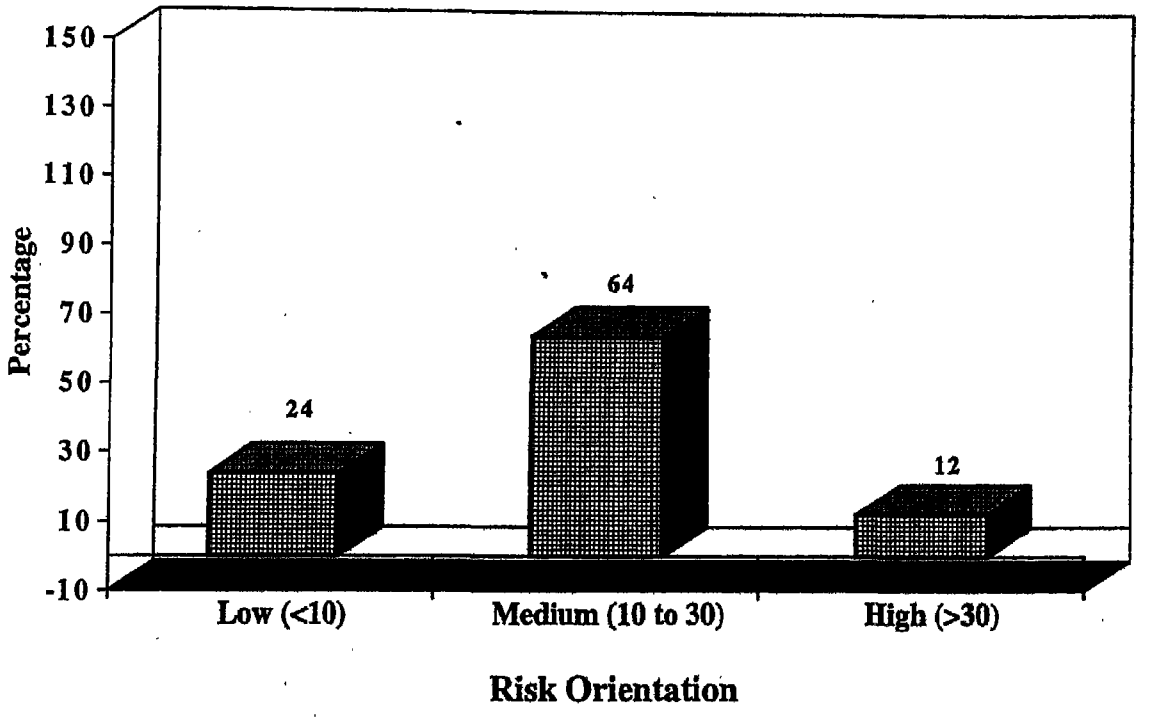
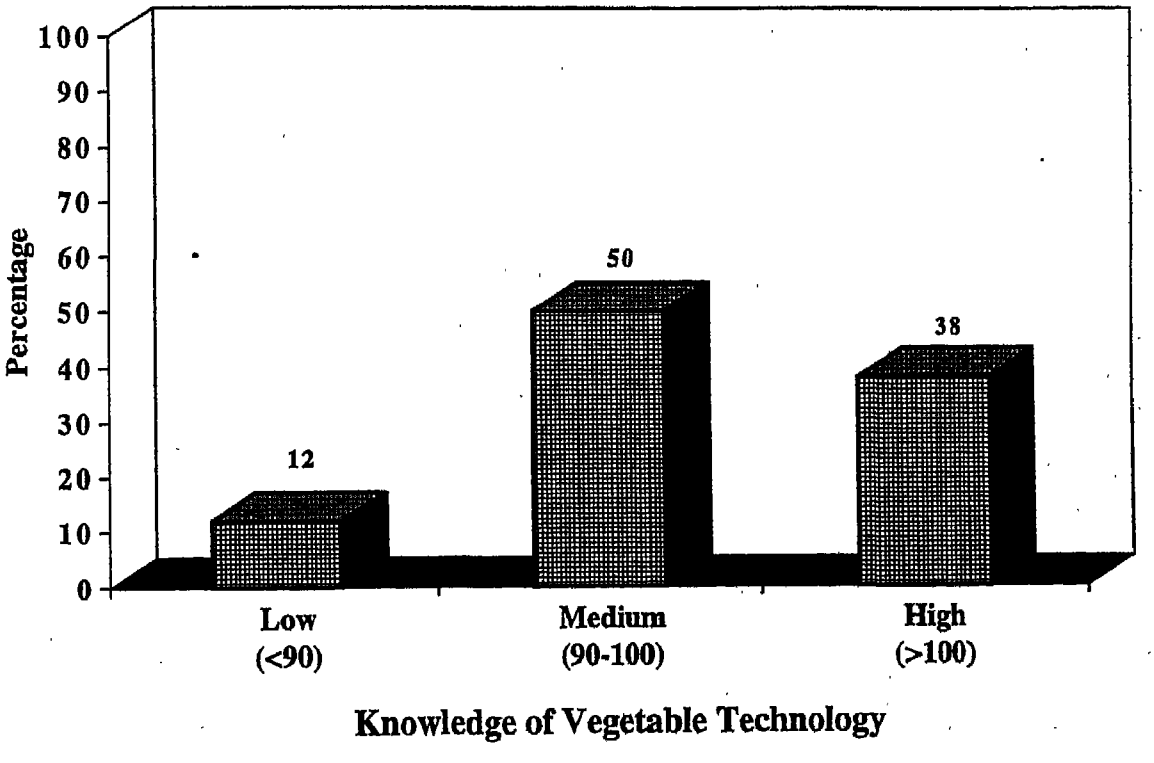


Fig. 17: Distribution of vegetable growers according to their Knowledge of Vegetable Production Technology



Majority of the respondents (50 per cent) were found to have medium level of knowledge of vegetable technology. Twelve per cent of the respondents had low level of knowledge of vegetable technology, whereas 38 per cent of them had high level of knowledge about vegetable production technology. Since, vegetables are cultivated commercially, very few vegetable growers were having low level of knowledge in this area. Almost 90 per cent of the respondents were having either medium or high level of knowledge of vegetable technology. It may be concluded that vegetable cultivation had boosted knowledge level of the farmers in this area.

17. *Infrastructural Facilities*

An index was developed exclusively for studying this variable based on the accessibility to the available infrastructure in the study area. The data collected regarding this is reported in Table-17.

Table-17: Distribution of vegetable growers according to their infrastructural facilities availability

Infrastructural Facilities	TS		PS		NS	
	F	%	F	%	F	%
1. Availability of market in the vicinity	50	100	-	00	-	00
2. Auction platforms/ rooms	1	2	26	52	23	46
3. Labour facilities	18	36	16	32	16	32

Contd...../-

Infrastructural Facilities	TS		PS		NS	
	F	%	F	%	F	%
4. Packing material/ packers facility	2	4	4	8	44	88
5. Covered space for loading-unloading	0	0	5	10	45	90
6. Transportation facility	48	96	2	4	0	0
7. Availability of credit facility	48	96	2	4	0	0
8. Availability of market information	25	50	12	24	13	26
9. Availability of collection platform for post harvest	1	2	9	18	40	80
10. Washing/cleaning and polishing facility	2	4	5	10	43	86
11. Packaging	0	0	3	6	47	94
12. Cold storage facility	0	0	17	34	33	66
13. Warehouse shed for storage	0	0	5	10	45	90
14. Processing facility at farm level	0	0	0	0	50	100
15. Agro-service centre at village level	46	92	1	2	3	6
16. Agro-chemical sale store	50	100	0	0	0	0
17. Advisory service to the farmers	48	96	2	4	0	0
18. Training for vegetable production	3	6	1	2	46	92
19. Seed sale depot	25	50	10	20	15	30
20. Fertilizers sale depot	46	92	1	2	3	6
21. Farmer literature	48	96	2	4	0	0
22. Seed multiplication programme	17	34	15	30	18	36
23. Vegetable crop demonstrations	1	2	3	6	46	92
24. Improved implements	0	0	2	4	48	96
25. Facility of vegetable nursery	0	0	4	8	46	92

TS = Total Satisfaction
PS = Partially Satisfaction
NS = No Satisfaction

As seen in the Table-18, eighteen per cent of the farmers were satisfied with the available infrastructural facilities. About 8 per cent farmers were found to be partially satisfied. About 24 per cent farmers were found to be not satisfied with the facilities available.

The most utilized infrastructural facilities by the farmers in order were – (1) availability of market in the vicinity, (2) transport facilities, (3) agro-service centre at village level, (4) agro-chemical shops, (5) advisory service to the farmers, and (6) seed and fertilizer sale depot. The most neglected infrastructures were auction platforms, packing facilities, covered space of loading-unloading, availability of collection platform for post harvest, cold storage, warehouse for storage, processing facility at farm level, training for vegetable production, improved implements and facilities for vegetable nursery.

There is a need to have extension activities in the study area especially to create opportunities for the vegetable farmers to have access to the neglected infrastructures without which a spectacular success in commercial vegetable cultivation can not be achieved.

Correlates of Commercial Vegetable Cultivation

Almost every farmer in India cultivates some vegetable crops on varying scales. There are some farmers who grow vegetables in very small area or in backyard of dwelling units or along fences etc. mostly for

domestic consumption. Many of such farmers are not able to produce vegetables sufficient enough to meet their own consumption need and they supplement it from vegetable market. There are some who produce enough to meet their consumption requirements and there may be other few who produce vegetables in excess of their consumption which they sell to others. But there are farmers who grow vegetables primarily for the market with sole objective of earning profit from the farming. They are again at varying scales in terms of proportion of their holdings put under vegetable cultivation. Under this scenario of heterogeneity in vegetable cultivation, it appears logical that commercialisation of vegetable cultivation is conceived in terms of the profitability earned by a farmer from vegetable cultivation. Hence, commercialisation of vegetable was defined in the present investigation, in terms of the net profit earned by a farmer per acre land per annum from vegetable cultivation.

Thus, net return from vegetable cultivation per unit of land per annum was treated as index of commercialisation of vegetable. It was felt necessary to see which socio-economic variables are the contributors to commercialization of vegetables. Commercialisation was then correlated with some selected socio-economic variables of the vegetable growers included in the present investigation. The correlation coefficients of commercialisation of vegetable cultivation are reported in Table-1.

Table-18: Correlation between commercialisation of vegetable cultivation and selected socio-economic variables of vegetable growers

S.No.	Socio-economic variables	Correlation coefficients values of commercialisation of vegetable cultivation
1.	Age	.327
2.	Education	-.2409
3.	Family size	.1056
4.	Family type	.0040
5.	Operational land holding	-.0769
6.	Farm machinery and equipment possession	-.1532
7.	Means of transport	-.2671
8.	Total income from vegetable cultivation	.3370*

*Significant at 0.01 level of probability

The data reported in Table-18, makes some interesting revealations which are as follows:

1. ***Total Income from Vegetable Cultivation***

Out of eight correlates included in the present investigation "total income" was found to be the only variable which was significantly correlationed with commercialisation of vegetable cultivation ($r=.337$, $p>.05$). This clearly indicates that the farmers having greater income from vegetable cultivation earn more profit from per unit area under vegetable. In other words, those who earn more are better adopters of modern

production technology and are able to harvest higher yields and better quality produce. Conversely, those who earn less from vegetable cultivation are less skilled and unequipped to use modern production technology. Consequently, they grow relatively poor crops of vegetables. This appears quite logical since vegetable is highly input intensive needing higher investment in cultivation which higher earners can easily afford and lower earners may be unable to fully afford the expenses. Some of the variables like; level of education, operational land holding, farm machinery and equipment possession and means of transport were found to yield negative correlation coefficients. The family size, family type and age were having positive correlation but were found to be non-significant.

The other correlation coefficients reported in Table-1 are statistically non-significant. Yet, they provide some interesting information which are as follows:

2. *Age and Education*

The correlation coefficient in this case narrowly escaped the statistical level of significance and was found positive in direction ($r=.3274$, $p<.05$). This correlation coefficient even though non-significant, clearly indicates that better vegetable growers are also older in age. On the face value, this does not appear logical since younger people are more

energetic but, the fact remains that majority of the vegetable growers were in the age group of 30-45 years and only 10 per cent of them were younger than 30 years of age. There was no body very old in the sample who might have lost his physical energy.

Further, this data may be viewed along with their data of formal education. The correlation coefficient is reported in Table-1. In case of education, it was found to be substantial though non-significant but negative. This means more educated vegetable growers were earning less from the crop than the less educated ones. Further, farmers younger in age had higher education and quite a few of them can be placed in the category of educated unemployed. They were involved in farming only because they could not get a white collar job else where. Thus, this group was younger in age, more educated but less involved in vegetable cultivation. Hence, their performance was worse than those who were older in age less educated but more involved in the profession.

3. *Land Holding, Farm Machinery and Equipment Possession and Means of Transport*

It is interesting that these three variables yielded non-significant but negative correlation coefficients. It is clear that these variables are not very important because of the low correlation coefficients, but their direction of relationship with commercialisation is quite meaningful. The

trend of relationship as indicated by the 'r' values is that farmers having larger land holdings owning more machinery and equipment and having modern means of transport, earn less profit/net income from vegetable cultivation. Infact, there is great commonality between the three variables. Those who have large land holding are also owners of modern farm machineries equipment and means of transport because of having higher economic capability, but then it is amazing to know, why such farmers with higher economic capability should earn less from per unit area they put under vegetables? The investigator's observation and personal experience of vegetable growers included in the investigation provide an explanation to this. The farmers who have smaller holdings of land have greater stake since they have to earn their livelihood from this smaller means of production. Hence, they work with greater involvement and dedication on the vegetable farms. Since, they have smaller means of transport like, bicycle etc. they sell their residual produce (which is small in quantity) in the villages around and neighbouring suburb of Delhi carrying their vegetables on cycles, as retailers which fetch higher prices to their produce. (By residual production I mean the production leftover after supplying to the mother dairy outlet). On the other hand, farmers having relatively larger holdings who also have relatively larger residual produce use more modern means of transport like tractors, trucks or bus, either individually or in groups and sell them in the whole sale market

(vegetable-mondi), where the price is relatively lower and expenditure on transport is more. This explains the phenomenon, why smaller growers are better earners from vegetable cultivation per unit area per annum than large grower.

4. Family Type and Family Size

The correlation coefficients yielded by these two variables are too small to be taken seriously. Hence, they can be ignored for the purpose of this study.

Communication and Psychological Correlates of Commercialisation of Vegetable Cultivation

The data reported in Table-20 bring to light the following:

Communication Variables

The two communication variables yielded positive but very small correlation coefficients. The two major mass media available to the farmers in the area are Television (TV) and Radio. Both the mass media broadcast farm technology programmes at specified time for five days a week. Almost all the respondents were the viewers and listeners of these two broadcasts. There was little inter-respondent variability in this respect due to which correlation coefficient was found to be so low. So far extension contact is concerned it was generally found to be very low for

the respondents of this study and their interpersonal variability was also in a very narrow range. Out of 36 possible score, most of the respondents got scores between 12 and 14 with an average of 13.98. May be that because of this narrow range of variability of the score the correlation coefficient was found to be so low.

Table-19: Correlation between commercialisation of vegetable cultivation and selected communication variables of vegetable growers

S.No.	Communication Variables	Correlation Coefficients Values of Commercialisation of Vegetable Cultivation
1.	Extension contact	0.0700
2.	Exposure to mass-media	0.1520

Psychological Variables

The two psychological variables included in the study failed to influence profitability in vegetable cultivation as is evident from the 'r' values reported in the Table-20. The data of risk orientation already reported in Table-20 reveal that 64 per cent of the respondents had moderate risk bearing capacity, 24 per cent low, while 12 per cent had high risk taking ability. Yet it does not seem to have influenced profitability in vegetable cultivation.

Table-21: Correlation between commercialisation of vegetable cultivation and selected psychological variables of vegetable growers

S. No.	Psychological Variables	Correlation Coefficients Values of Commercialisation of Vegetable Cultivation
1.	Risk orientation	0.0909
2.	Knowledge of vegetable production technology	-0.0931

*Significant at 0.01 level of probability
** Significant at 0.05 level of probability

Knowledge of the vegetable cultivation technology is certainly a variable which could influence the profit earning from vegetable cultivation, but in the present study the farmers included in the sample were found to have moderate knowledge of vegetable cultivation technology (average obtained score was 97.92 out of the total possible score of 180). But the range of their obtained score was found to be quite narrow (between 90 and 119). This clearly indicates that their inter-respondent variation in this respect was very low. It is, therefore, understandable that their knowledge failed to function as a variable sufficient enough to influence their earning from the crop.

Infrastructural Correlates of Commercialisation of Vegetable Cultivation

There are three infrastructural components included in the present investigation. They are market facility, post-harvest facility and technology support facility. The correlation coefficients of these 3 variables with commercialisation of vegetable cultivation are reported in Table-21.

Table-21: Correlation between commercialisation of vegetable cultivation and selected infrastructural variables of vegetable growers

S. No.	Infrastructural Variables	Correlation Coefficients Values of Commercialisation of Vegetable Cultivation
1.	Market facility	-.2275
2.	Post-harvest facility	.1762
3.	Technology support facility	.0409

*Significant at 0.01 level of probability
** Significant at 0.05 level of probability

The correlation coefficient of market facility with commercialisation was not found to be significant but showing negative direction indicating that those who availed more market facility tended to earn less than those who availed less of this facility. This is understandable in more than one

way. The smaller growers after supplying their produce to "Mother Dairy" out let, used to be left with smaller quantity of vegetables, which they did not take to the mandi, but sold to the local consumers on retailer's price and earned more profit. On the other hand, the larger growers used to take their surplus produce (after supplying to the Mother Dairy out let) to the local mandi. They spent on transportation and paid the auction platform rent. The rate was whole sale, which is less than the consumer's rate. Hence, their profit margin was substantially reduced.

In case of post-harvest facility the vegetable grower's market needs did not include some of the commonly understood post harvest facilities like packaging, cold storage, ware housing and processing facilities etc. Hence, there was little difference between those who earned more profit and those who earned less profit in this respect. This is, therefore, the prime reason that the correlation coefficient in respect of this variable was found to be so low.

In the name of technology support, only the services provided by Mother Dairy organisation were available to them which were almost equally available to every grower. These services include supply of seedlings, plant protection tips etc. Hence, this did not function as a substantive variable due to which correlation coefficient was so low.

Issues that Emerged during the Group Discussions held with the Farmers of Villages Palla and Bakhtawarpur

1. Availability of labour was a constraint with vegetable cultivation. In case of vegetables, the cropping pattern was very intensive and most of the operations required human labour. Hiring of labour is very expensive, hence the cultivation is generally carried out with family labours. Most of the families are nuclear, hence there was a serious labour constraint.

2. Mother Dairy had opened Bakhtawarpur Collection Center for Spinach (Palak) and Palla for Radish, though they also take some quantities of other vegetables like, cauliflower, knol-khol etc. Thus, these outlets were available only for part of their produce. Even in case of the specified vegetables like, palak and radish. Mother Dairy is able to purchase only a limited quantity. Many times, the total produce was much greater than the outlet purchases. Hence, the Mother Dairy system was quite inadequate in meeting the market needs of the growers.

3. Mother Dairy had fixed indent for the vegetables for each center. They generally do not lift larger than the indented quantity.

4. The sale through Mother Dairy center was about 10 per cent of the total production in winter season. The rest of the produce was being still supplied to Azadpur Mandi through their established channel-truck owner-'arhati'-sale by 'arhati' (self in some cases) and payment after deductions made for the service charges, platform rent etc.

5. The vegetable collection and supply centers were operated by a villagers' Association which was unregistered. It was managed by a group of villagers in private league with the Mother Dairy sale point functionary. Secretary is a paid villager who exercises his authority in his own way in league with the President of the Association and a few influential villagers.

6. 1.75 per cent handling charge is made to the Association to meet cost of godown, salary, telephone etc. President of the Association receives and disperses amount to farmers weekly. Many of them need the payment daily.

7. The village Association managing the collection center is a close group of villagers, some of whom were said to be even landless villagers. They did not allow other villagers to buy membership of the Association since purchase of vegetables from the members receive priority over the non-members.

8. In lean season when market price is high, farmers, in general are less interested in sale through Mother Dairy center since they get higher or at least the same price on daily cash basis in the mandi. During the period of plenty of production and lower sale price prevailing in 'mandi', they compete and even fight with others to sell their produce through Mother Dairy sale point due to the reasons (a) price stability, (b) guarantee of sale/supply, (e) economy due to saving of transport cost and labour otherwise required if sold in Azadpur 'mandi'.

9. Mother Dairy indent for purchase was quite inadequate in quantity and variety and hence was not big incentive for the farmers to go for vegetable cultivation. Their dependence on 'mandi' is as usual heavy and Mother Dairy sale arrangement is only marginal market support to the trade.

10. Services provided by Mother Dairy were supply of seedlings on payment and free advice provided by experts for plant protection etc. on demand.

11. There was mistrust amongst villagers. The managers of Mother Dairy procurement center and even employees of Mother Dairy organization were considered dishonest and exploiter by many villagers without any valid reason. Many of them were also

unreasonable in expecting benefit for the Mother Dairy arrangement. Some of them expect a share even in the handling charge (1.75 per cent) paid by Mother Dairy for functioning of the center.

12. Cooperative spirit among villagers was seriously lacking. They appeared to be highly self centered with absolutely no concern for others and social responsibilities.

The Farmers' Views and Suggestions to Improve Commercialization of Vegetable Cultivation

An attempt has been made to analyze the data collected on farmers' views and their suggestions to improve commercialization of vegetable cultivation using content analysis. The results and inferences drawn, are being discussed below:

Selected vegetable growers were asked to express their views and give suggestions to improve the commercialization of vegetable cultivation. More than two-thirds of the respondents expressed the need of regular supply of electricity so that tube well could be operated whenever needed. However, 31 per cent of the vegetable growers were partly satisfied with the present supply of electricity.

The vegetable growers were further asked to express their views and provide suggestions on availability and use of agricultural inputs like seed, fertilizers and agricultural chemicals. As many as 98 per cent of them expressed their dissatisfaction with the quality and cost of the inputs available in the market. Most of the farmers suggested opening of Government shops or centers in rural areas to ensure adequate and timely supply of quality inputs to the farmers at reasonable rates. Eighty per cent of the respondents emphasized the need to have regular checking of private input dealers' shops to stop malpractices being followed by them. This would aid in providing quality and standard agricultural inputs like seeds, fertilizers and insecticides/pesticides etc. It was however, interesting to note that some vegetable growers (20 per cent) did not offer any suggestions, indicating their satisfaction with the present situation.

Similarly, vegetable growers expressed their concern over paucity of human labour as a serious constraint to commercialization of vegetable in Delhi. To overcome this problem, as many as 80 per cent vegetable growers suggested that optimum wages should be decided by the Government and the same should be enforced to check their migration from rural to urban area. Some of the vegetable growers (20 per cent) had shown their keen interest in establishing fruit and vegetable processing industries at village level so that profitability may increase through value

addition and a new market is created for the vegetables produced by the farmers.

The vegetable growers also expressed their need to have easy and cheap availability of farm machinery and equipments so that the cost of vegetable cultivation may reduce. It was observed that little more than a half of the vegetable growers had no access to modern or improved agricultural implements or farm machinery for vegetable cultivation. Similarly, one-fifth of them had no skill to make use of these new implements. In view of this, they suggested exposure to training programme on maintenance and handling of new implements.

It was amply clear from the observation that the vegetable growers were not happy with the present infrastructural and post-harvest technologies available to them. Due to inadequate facilities, vegetable growers could not fetch remunerative price for their farm produce. All the vegetable growers wanted to create vegetable processing units in their area. They expected that it would help them in getting better price for their produce and it would sustain their income from vegetable cultivation. They further suggested that agencies like mother dairy should come forward for establishing processing units in the area so that farm produce can be sold directly to them.

Further probes and observation on marketing facilities revealed that vegetable growers were dissatisfied with the present marketing facilities. Half of the vegetable growers wanted that the Government should arrange for a separate space in the vegetable 'mandi' for sale of their farm produce. They also expressed their need for better market information, transportation, proper storage and processing facilities as well as control and check over middlemen or traders.

It was suggested that an extension agency had to play vital role in creating awareness about scientific way of vegetable farming, helping them to gain knowledge and improve skill on various relevant agro-techniques of vegetable production. They also demanded to strengthen linkages and to have better ties with mother dairy and Indian Agricultural Research Institute, New Delhi for providing farm advisory services to them.

Nearly two-thirds of the vegetable growers reported that they had an access to the credit institutions, mostly nationalised banks in the area. However, procedures of getting financial assistance to them were quite complex and more time consuming. Therefore, majority of them were reluctant to avail of credit facilities. Most of the farmers offered their suggestions to simplify the procedure and official formalities for getting loan or any kind of financial assistance from these banks. They also

expressed their views to lower down the interest rates and modify the mode of repayment pattern so that it becomes easier to clear up their loans taken from banks. If these problems were resolved by the credit institutions, it would not only help the vegetable growers to invest effectively in vegetable farming but also provide an opportunity to boost vegetable production to a great extent.

Chapter - V

SUMMARY AND CONCLUSION

Agricultural Development programmes in India had been given prime consideration in the National Plans. Though vegetable production index in India has been constantly moving up but the productivity of various vegetable crops still falls short of the levels desired to be attained. However, in the recent past the introduction of hi-tech vegetable production technologies seems to have added new dimensions in Indian vegetable farming system particularly for rural poor who command limited land resource. The adoption of hi-tech vegetable production technologies has acquired importance for the vegetable growers particularly for small, marginal and landless labourers in the rural areas. The magnitude of benefits of vegetable production programmes is reflected in the creation of additional man days employment and remunerative source of income through vegetable cultivation.

It has been observed that the farmer's socio-economic, psychological and infrastructural attributes play an important role in

the adoption of hi-tech vegetable production technologies. Review of research studies done in the past on vegetable cultivation shows that all these attributes of farmers have not been studied together to give comprehensive picture. There are hardly any study on commercialisation of vegetable cultivation. Therefore, it was felt necessary to examine the important role played by the different attributes of the vegetable growers in the present investigation.

Keeping in view, the aforestated aspects in view, the present study was planned with the following objectives:

1. To study the socio-economic and psychological profile of vegetable growers.
2. To study the socio-economic, infra-structural correlates of commercialisation of vegetable cultivation.
3. To explore the factors promoting farmers' participation in the institutionalised endeavour.
4. To study the farmer's views and suggestions to improve commercialisation of vegetable cultivation.

The study was conducted in two villages namely, Palla and Bakhtawarpur of Alipur community development Block of National Capital Territory (NCT) Delhi where the 'Mother Dairy' vegetable

project is in operation. This area has the more than 60 per cent of the cropped area under vegetable cultivation. Thus, the Alipur Block was selected purposively for carrying out this investigation. The sample of the study consisted of 100 vegetable growers, 50 were Mother Dairy members from both the villages and 50 non-members of Mother Dairy. Twenty five farmers from each village were selected randomly. The data were collected with the help of pre-tested structured interview schedule by interviewing the vegetable growers personally. The dependent variable of the study was the commercialization of vegetable cultivation. The independent variables were age, education, caste, social participation, occupation, operational land holding, total annual income, farm machinery and equipment possession, source of irrigation, means of transport. Psychological variables were knowledge of vegetable production technology, risk orientation, and communication variables were extension contact, exposure to mass-media. The infrastructural variables were market facility, post harvest facility, and technology support facility. The data were collected by two methods. One was use of structured interview schedule and the other was through group discussion and observations through PRA technique. The data were analysed by computing mean, standard deviation, percentage and correlation.

The salient findings of the study were:

I. Socio-Economic Profile of Selected Vegetable Growers

1. A little more than half of the vegetable growers (56 per cent) belonged to the middle age group.

2. Nearly two third of the vegetable growers (60 per cent) were having upto high school education.

3. Forward caste farmers who were having land in plenty could afford vegetable cultivation whereas this was not the case for backward, schedule caste and schedule tribe farmers.

4. About 96 per cent of the vegetable growers had medium and large families, which revealed that since vegetable cultivation is labour intensive, only large and medium size families had enough family labour who could afford vegetable cultivation.

5. About 70 per cent of the vegetable growers were living in joint families. Since vegetable cultivation requires lot of man power round the year, the vegetable growers had their family labour engaged in the field operations.

6. About 98 per cent of the vegetable growers were having vegetable cultivation as the only source of their earning. The popularity of the vegetable cultivation in the block could be attributed to the higher income being generated due to intensive vegetable cultivation because of the availability of irrigation and marketing facilities.

7. Out of total 100 vegetable growers, 50 were members of fruit and vegetable society of mother dairy because this organisation was providing better marketing facility in their area.

8. Majority of the vegetable growers (78 per cent) were operating in marginal and small holdings.

9. Majority of the vegetable growers (72 per cent) were having low level of farm machinery and equipment possession due to heavy dependence on manual labour and dearth of technology and equipment for vegetable cultivation.

10. Sixty per cent vegetable growers were observed to hire truck/tempo for transportation of vegetables. This practice was liked by farmers. There was no problem reported about transport in the area for carrying vegetables to the market (*Mandi*).

11. Out of 50 vegetable growers, all vegetable growers were having tube well for the irrigation of vegetables because in this area water level was very high.

12. A total of 98 per cent of the vegetable growers were having either medium or high level of income which might be due to intensive vegetable cultivation.

13. A little more than half of the vegetable growers (56 per cent) were having medium level of extension contact.

14. More than 94 per cent of the vegetable growers were exposed to mass-media from medium to high level.

15. About 88 per cent of the vegetable growers had low or medium level of risk taking ability of the vegetable cultivation because they had realized not much risk in vegetable cultivation.

16. Almost 90 per cent of the vegetable growers were having either medium or high level of knowledge of vegetable technology. Because regular vegetable cultivation had boosted their knowledge level.

17. Out of 50 vegetable growers, only 32 per cent farmers were found to be not satisfied with the infrastructural facilities available in the project area.

II. Correlates of Commercial Vegetable Cultivation

18. Age was found to have positive relation with the commercialisation of vegetable cultivation. This indicates that older farmers prefer more vegetable cultivation.

19. Education was found to have substantial though non-significant but negative correlation with commercialization of vegetable cultivation. It means less educated farmers were more successful in commercialising vegetable cultivation.

20. Land holding, farm machinery and equipment possession and means of transport yielded non-significant but negative correlation co-efficient with commercialization of vegetable cultivation.

21. Communication variables like extension contact and exposure to mass-media were found to have positive but very small correlation co-efficient.

22. Psychological variables like risk orientation and knowledge of vegetable cultivation technology were found to have moderate risk bearing capacity and medium knowledge of vegetable cultivation technology respectively.

23. Infrastructural variable like, market facility was not found to be significant and showing negative direction with commercialization. The post-harvest facility and technology support facility were found to have non-significant correlation co-efficient with commercialization.

Factors Promoting Farmers Participation in the Institutionalised Endeavour

To explore the factors promoting farmers participation in the institutionalised endeavour, village level discussion of farmers and scientists was organised. The following main issues emerged during the group discussions in the study area.

1. Availability of labour is one of the main constraints with vegetable cultivation. In case of vegetable, the cropping pattern is very intensive and most of the operations require human labour. Hiring of labour is very expensive charging Rs. 100-150 per day hence the cultivation is generally carried out with family

labourers. Most of the families are nuclear, hence there is a serious labour constraint.

2. Mother Dairy has opened Bakhtawarpur collection center for Spinach and Palla collection center for Radish, though they also took some quantities of other vegetables like cauliflower, knol-khol etc. Thus these outlets are available only for part of their produce. Even in case of the specified vegetables like spinach and radish, Mother Dairy is able to purchase only a limited quantity (10 per cent). Many times the total produce is much more than the outlet purchases. Hence, the Mother Dairy system is quite in adequate in meeting the market needs of the growers.

3. Mother Dairy has fixed indent for the vegetables for each center. They generally do not lift larger than indented quantity. This does not help the farming community. In that case, they have to carry the extra quantity to market. They would prefer if their whole produce is taken by Mother Dairy at the village itself.

4. The sale through Mother Dairy center was about 10 per cent of the total production in winter season. Rest of the produce was still being supplied to Azadpur Mandi through their established channel-truck owner-arhati-sale by arhati (self in some cases) and

payment after deductions made for the service charges, platform rent etc.

5. The vegetable collection and supply centers were operated by a villager's Association which was unregistered. It was managed by a group of villagers in private league with the Mother Dairy sale point functionary. Secretary is a paid villager who exercises his authority in his own way in league with the president of the Association and few villagers. Their services were not entirely satisfactory for most of the farmers.

6. A 1.75 per cent handling charge is made to the Association to meet cost of godown, salary, telephone etc. President of Association receives and disperses amount to farmers weekly.

7. The village Association managing the collection center is a close group of villagers, some of whom were said to be even land less villagers. They did not allow other villagers to buy membership of the Association since purchase of vegetables from the members receive priority over the non-members.

8. In lean season when market price is high, farmers, in general are less interested in sale through Mother Dairy center since they get

higher or atleast the same price on daily cash basis in the Mandi. But during the period of plenty of production and lower sale price prevailing in Mandi, they compete and even fight with others to sell their produce through Mother Dairy sale point, due to following reasons – (a) price stability (b) guarantee of sale/supply (c) economy due to saving of transport cost and labour otherwise required if sold in Azadpur Mandi.

9. Mother Dairy indent for purchase is quite inadequate in quantity and variety and hence has no big incentive for the farmers to go for vegetable cultivation. Their dependence on Mandi is as usual heavy and Mother Dairy sale arrangement is only marginal market support to the trade.

10. Services provided by Mother Dairy are-supply of seedlings on payment and free advice provided by experts for plant protection etc. on demand. The farmers were generally satisfied with such services.

11. There is a mistrust amongst villagers. The managers of Mother Dairy procurement center and even employees of Mother Dairy organization were considered dishonest and exploiter by many villagers without any valid reasons. Many of them were also

unreasonable in expecting benefits from the Mother Dairy arrangement. Some of them expect a share even in the handling charge (1.75 per cent) paid by Mother Dairy for functioning of the center.

12. Cooperative spirit among villagers was seriously lacking. They appear to be highly self centered with absolutely no concern for others and social responsibilities.

Farmers' Views and Suggestions to Improve Commercialization of Vegetable Cultivation

1. All vegetable growers expressed their views about the role of irrigation network and facilities to improve the commercialisation of vegetable cultivation. More than two-third gave their opinion in favour of regular supply of electricity. However, 31 per cent of the vegetable growers were partly satisfied with the present supply of electricity.

2. As many as 98 per cent of the vegetable growers had expressed their dissatisfaction over the quality of their critical inputs as well as its exorbitant cost. However, few vegetable growers (21 per cent) were found content with the availability and use of critical

inputs. To over come this problem most of the vegetable growers suggested opening of Government shops or centers in rural areas and ensure their adequate and timely supply and availability of quality critical inputs at reasonable rates. About 80 per cent vegetable growers emphasized the need to have better control and check over the private shops of critical inputs.

3. Similarly, vegetable growers expressed their views and offered suggestions on the availability of human labourers to pave way for vegetable commercialization. As many as 87 per cent vegetable growers expressed their concern for scarcity of labour to work on their farms. To over come this problem, as many as 80 per cent respondents suggested that optimum wages should be decided by the Government and the same should be uniformly paid to the labourers to check their migration from rural to urban centers.

4. The vegetable growers had also expressed their views and offered their suggestions on the easy and cheap availability of farm machinery and equipment that would lead to commercialisation of vegetables. More than a half of the vegetable growers had no access to modern or improved agricultural implements for

vegetable cultivation. However, remaining others had access to it. They also felt that these implements and machineries were quite expensive and should be made available at subsidised rates or sold at cheaper rates near their villages. One-fifth of the vegetable growers were unable to procure modern implements due to their high cost. Similarly, one-fifth of them had no skill to make use of these new implements. In view of this, they suggested for organising the training programme on the maintenance and handling of new implements.

5. All respondents were not happy with present infrastructural post-harvest facilities in their areas. Due to inadequate facilities, vegetable growers could not get remunerative price for their farm produce. All the vegetable growers wanted to have vegetable processing units in their area. They also suggested that some agencies like Mother Dairy should come forward for establishing processing units in their area so that farm produce can be sold directly to such agencies. Ultimately this will lead to minimise the post-harvest losses and in turn improvise vegetable commercialisation.

6. All vegetable growers were dissatisfied with present marketing facilities. Half of the vegetable growers wanted that government should arrange for a separate space in the market (Mandi) for the sale of their farm produce and to get better price. They also expressed their concern for better marketing information, optimising transportation cost, proper storage and processing facilities as well as control and check over middlemen or graders.

7. The vegetable growers emphasized creating training centers in their areas so that training could be imparted on various aspects of vegetable production technologies in enhancing vegetable production and productivity. It was also expressed by most of the farmers that there was a need to strengthen extension services in their areas. It was suggested that an extension agency had to play vital role in creating awareness about scientific way of vegetable farming, helping them to gain knowledge and improve skill on various relevant agro-techniques of vegetable production. They also demanded to strengthen linkages and have better ties with Mother Dairy and Indian Agricultural Research Institute, New Delhi for providing farm advisory services to them.

8. Nearly two-thirds of the vegetable growers reported that they had an access to the credit institutions, mostly nationalised banks in the area. However, procedures of getting financial assistance to them were quite complex and more time consuming. Therefore, majority of them were reluctant to avail of credit facilities. Most of the farmers offered their suggestions to simplify the procedure or official formalities for getting loan or any kind of financial assistance from these banks. They also expressed their views to lower down the interest rates and modify the mode of repayment pattern so that they could find it easier to clear up their loans taken from banks. If these problems were resolved by the credit institutions, it would help the vegetable growers to invest effectively in vegetable farming leading to higher commercialization of vegetable cultivation.

IMPLICATION AND SUGGESTIONS

The findings of the study may be utilised by the Extension Agencies, Non-Government Agencies, Center for Agriculture Technology Assessment and Transfer (CATAT), Fruit and Vegetable Scheme of Mother Dairy, State Department of Horticulture, Policy makers and other similar organisations engaged in vegetable production and marketing.

The vegetable growers were found to have medium or high level of knowledge of vegetable production technology. They however, did not practice hi-tech vegetable technology which may be introduced and promoted through training programmes and intensive extension strategy. The center for Agriculture Technology Assessment and Transfer of IARI may take note of this.

Risk taking ability of the vegetable growers was found to be moderate. This is a strength which may be further exploited to moblise farmers to go for hi-tech vegetable cultivation by giving them adequate knowledge and skill in planning for more profitable production strategy. The vegetable growers were exposed to mass media much more than interpersonal contact. This brings to light that radio and TV

coverage of vegetable production technology at Delhi is quite good and farmers rely on them for new knowledge. On the other hand, extension change agents do not seem to maintain adequate contact with the farmers. This requires to be corrected. The extension agency should be more active to have close contact with vegetable growers to help them produce more since Delhi is an excellent vegetables market. Vegetable growers were found to have low level of farm machinery and equipment possession and had heavy dependence on manual labour. Human labour is a scarce commodity in Delhi. Hence, it is extremely important that labour saving devices are introduced for vegetable cultivation. CATAT has the technological capability to do this by involving scientists of Agricultural Extension Division of IARI for this purpose. This may be taken note of.

Education was found to be substantial though non-significant but negative correlation with commercialization of vegetable cultivation. It appears less educated farmers were more successful in commercializing vegetable cultivation. The probable reason for this state of affairs is that more educated vegetable growers, in fact, are educated unemployed who takes only supportive role in vegetable cultivation. In case some vegetable based process industry or other enterprises are promoted for

the educated unemployed, they will be more productive and this will also improve the village economy.

The findings regarding infrastructural facilities utilization of the vegetable growers as reported in Table-17, revealed that many important infrastructures are neglected in Delhi. This calls for greater investment on infrastructure development towards which the Delhi Government should pay greater attention.

Suggestions for Future Research

Based on the results obtained in this study, the following suggestions for future research are recommended.

1. The present study is confined to determine the commercialization of vegetable cultivation with regard to vegetable growers of Mother Dairy. Another study may be formulated in order to analyse the commercialization of vegetable cultivation for Mother Dairy members and non-members.

2. An other study may be formulated on the consumer's satisfaction about the services and supply of vegetables and fruits at Mother Dairy booths.

3. A scale on commercialization of vegetable cultivation may be developed.

4. A study may be formulated on the job satisfaction of the employees of Fruit and Vegetable Scheme of Mother Dairy staff.

5. Further researchers should devote more attention on case study of vegetable growers who have left the membership of Mother Dairy.

6. The cost and benefit of Mother Dairy system and strengthening its activity at national level.

7. Comparative study of consumer satisfaction of Mother Dairy vegetable and Fruit users and direct market vegetable users.

8. Organizational structure of Mother Dairy Vegetable and Fruits Scheme, its strength and limitations.

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Serial No.: .....

COMMERCIALISATION OF VEGETABLE CULTIVATION — AN INSTITUTIONAL INTERVENTION

FARMERS INTERVIEW SCHEDULE

DIVISION OF AGRICULTURAL EXTENSION
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI - 110 012

FARMERS INTERVIEW SCHEDULE

Name of the Village: _____ Block: _____

State: _____ District: _____ Date: _____

Name of the Respondent: _____

Father's Name: _____

1. Age of the Respondent: _____ , 2. Education: _____

3. Caste: _____ 4. Family size:

Male: _____
Female: _____
Total: _____

5. Family Type: Joint / Nuclear

6. Occupation: Main: _____ Subsidiary: _____

7. Social Participation — Are you a member of any of the organisation? Yes / No, if yes, then in what respect?

S. No.	Organisations	Member	Office bearer
1.	Multipurpose cooperative society (Seed, fertilizer etc.)		
2.	Village Panchayat		
3.	Panchayat samiti		
4.	Rural youth club		
5.	Zila parishad		
6.	Religious committee		
7.	Political organisation		
8.	Milk cooperative society		
9.	Fruit & vegetable producers society		
10.	Any other (specify)		

8. Operational land holding

S. No.	Land holding	Irrigated (Acre/ha)	Unirrigated (Acre/ha)
i.	Land owned		
ii.	Leased in		
iii.	Leased out		
	Grand Total		

9. Farm machinery & Equipment possession

	Agril. implements	No.
	Tractor	
	Trolly	
	Cultivator	
	Harrow	
	Land leveller	
	Bullock cart	
	Thresher	
	Winnower	
	Power Chaffcutter	
	Sprayer	
	duster	
	Pumping set (electric)	
	Pumping set (diesel)	
	Any other (specify)	

10. Sources of Irrigation

Particulars	Source			
	Cannel	Tube Well (Electric)	Diesel Pumpset	Any other (Specify)
Irrigated area (Acre)				
Number of Assured Irrigations				

11. Please give the following details about the major vegetable crops grown during 1996-97

Seasons	Crops	Variety	Area (acre)	Yield (qt/acre)	Quantity Sold (@ Rs./kg)	Amount (Rs./acre)	Remarks
Kharif 1. 2. 3. 4. 5.							
Rabi 1. 2. 3. 4. 5.							
Summer 1. 2. 3. 4. 5.							

12. Do you market your vegetable? Yes / No
If yes, then where?

Sources	Approximate Quantity			
	Daily	Weekly	Monthly	%age of total produce
Village Dalal in the village itself				
Mother dairy				
Local market (Hatt)				
Cooperative Society				
Vegetable Mandi (i) Retailor (ii) Commission agent				
Restaurant				
Any other (Specify)				

13. Means of Transport for carrying vegetables

Means	Self	Hired	Rate of rent (Per day)	Total (Rs.)
Bicycle				
Cycle Rikshaw				
Motorcycle/Scooter				
Three Wheeler				
Car/Jeep				
Truck (i) Sole (ii) Group				
Bus				
Tractor				
Bullock Cart				
Tounga				

14. Annual Income —

Income during the last year (1996-97)

Enterprise	Kharif	Rabi	Summer	Total Amount
1. <u>Agriculture</u> i. Income from sale of milk and milk products (per month)				
ii. Income from Crop Enterprise a) Grain b) Dry fodder c) Green fodder				
iii. Income from Vegetables <u>Crops</u> 1. 2. 3. 4.				
2. <u>Other Source</u> a. Labour				
b. Shop/Business				
c. Service				
Any other (Specify)				

15. Sources of credit for vegetable cultivation only (during last 3 years).

Source	Amount	Interest Rate	Repayment		Opinion/ Specific experiences
			Schedule	Payment made	
Commercial Banks					
Cooperative Bank					
Land Development Bank					
Money Lenders					
Friends/Relatives					
Any other (Specify)					

16. Expenditure incurred:

Please give the details about expenditure incurred during vegetable crop production (1997-98).

A. Labour Cost

Operations	Human Labour			Total Expenditure (Rs.)
	Family	Hired	Rate/day	
1. Land Preparation i) Nursery ii) Ploughing iii) Lavelling/Bunding iv) Up-rooting & Seedling v) Any other				
Total				
2. Sowing/Transplanting				
3. Thining/Gapfilling				
3. Hoeing/Weeding				
5. Earthing				
6. Spraying				
7. Dusting				
8. Fertilizers application				
9. Irrigation				
10. Harvesting				
11. Bundling/roading				
12. Marketing				
13. Transportation				
14. Any other				
Grand Total				

B. Cost of Inputs

Name of Input	Quantity			Opinion/Experiences
	No.	Kg	Rate/Kg	
1. Seed				
2. F.Y.M.				
3. Nitrogenous Fertilizers i) ii) iii)				
4. Phosphatic Fertilizers i) ii) iii)				
5. Potashic Fertilizers i) ii) iii)				
6. Minor nutrients				
7. Zinc Sulphate				
8. Irrigations				
9. Fungicides i) ii) iii)				
9. Pesticides i) Chemical ii) Bio-pesticides				
10. Weedicide i) ii) iii)				
11. Rodenticide i) ii) iii)				

C. Other Expenditure

i) Hire charges of implements _____
ii) Rent of land _____
iii) _____
iv) _____
v) _____

Total A+B+C

17. Extension Contact:

A. How often during the last year you met the following in connection with vegetable cultivation?

Persons	(3) Frequently (6 times)	(2) Often (4-6 times)	(1) Seldom (4-3 times)	(0) Never
Village Development Officer				
Agricultural Extn. Officer				
Block Development Officer				
Distt. Horticulture Officer				
Staff of Mother Dairy				
Scientist of IARI				
Any other (Specify)				

B. How often during last one year the following officials visited you in connection with vegetable cultivation?

Persons	(3) Frequently (6 times)	(2) Often (4-6 times)	(1) Seldom (1-3 times)	(0) Never
Village Development Officer				
Agricultural Extn. Officer				
Block Development Officer				
Distt. Horticulture Officer				
Staff of Mother Dairy				
Scientists of IARI				
Any other (Specify)				

18. Exposure to Mass Media:

A. Do you watch Krishi Dharsan/Ankur programme of Doordarshan (TV) daily? Yes / No

If not, what is the frequency?

B. Do you listen to Agril. Programme of AIR (All India Radio)? Yes / No

If yes, name of the programme & frequency.

Programme	Frequency
i)	
ii)	
iii)	

C. When did you visit the following in last 3 years?

Items	No.	Place	Year and Month of Visit
Farmer's Fair			
Agriculture Exhibition			
Vegetable Show			
Farmer's Day			
Vegetable Crop Demonstrations			
Meetings			
Farmers conducted tours			
Training Courses on Vegetables			
Mother Dairy			
Any other (Specify)			

D. Printed Material

i) Do you subscribe with any farm magazine? Yes / No

If yes, please name the magazine: .....

ii) Have you received any pamphlet/leaflet etc. on vegetable during last three years? Yes / No

If yes, please indicate the source, time and topic .....

19. Risk Orientation:

20. Knowledge of vegetable production technology.

Particulars	Crops				
	Radish	Turnip	Palak	Cauli-flower	Brinjal
1. Have you heard about improved/ hybrid varieties? Yes / No If Yes, then name 2-3 varieties.					
2. What is the seed rate/acre?					
3. Are you practicing seed treatment? Yes / No If Yes, name of fungicide & dose for per kg seed treatment.					
4. Please mention the practices followed for nursery raising. i) Method ii) Size iii) Doses of fertilizers					
5. What is the recommended spacing? i) Line to line ii) Plant to plant					
6. What is the recommended doses of fertilizers/acre? i) Basal dose ii) Top dressing					
7. Are you using organic manures? Yes / No If Yes, then i) Quantity/acre ii) Reasons					
8. Number of irrigations for maximum crop yield					
9. Have you heard about weedicides? Yes / No If yes, please mention i) Name ii) Doses litre/acre					
10. Do youu know the important pests? If so, please mention name of pests of crop.					
11. Have you heard about pesticides? Yes / No If yes, please mention the i) Name ii) Doses litre/acre					

12. Please mention the important diseases. i) ii) iii)					
13. Have you heard about nematodes? Yes / No If yes, please mention how you will identify?					
14. How you will control the nematodes?					
15. Have you heard about Bio-pesticides? Yes / No If yes, please mention the i) Name ii) Doses of Bio-pesticides					

21. Infrastructural Variables

Infrastructure facilities	**TS**	**PS**	**NS**	**Role of Mother Dairy**
1. Marketing facility-				
(i) Availability of market in the vicinity				
(ii) Cool room facility				
(iii) Quality checks/Grading facility				
(iv) Preparation for auction				
(v) Auction platforms/rooms				
(vi) Labour facilities				
(vii) cold storage facility				
(viii) Packing material/packers facility				
(ix) Transportation facility				
(x) Availability of credit facility				
(xi) Availability of market information				
2. Any other Post Harvest practices facility				
(i) Availability of collection platform				
(ii) Washing/clearing and polishing				

(ix) Warehouse shed for storage				
(x) Covered space for loading, unloading				
(xi) Processing facility at farm level				
3. Technology Support facility .				
(i) Availability of Agro-Service Centre at Village level.				
(ii) Agro-chemicals sale store				
(iii) Availability of I.P.M. technology to the farmers.				
(iv) Vegetable growers training centre				
(v) Seed/fertilizers sale depo				
(vi) Farmer literature				
4. Linkage with clients.				
(i) Formation of farmers Society				
(ii) Seed multiplication programme				
(iii) Vegetable crop demonstrations				
(iv) Providing Improved implements				
(v) Facility of Hybrid vegetable plants to the forms.				

TS Total Satisfaction
PS Partly Satisfaction
NS Not Satisfaction