A STUDY ON SOCIO-ECONOMIC PROFILE OF DRIP IRRIGATION FARMERS IN SHIMOGA AND DAVANAGERE DISTRICTS OF KARNATAKA

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A STUDY ON SOCIO-ECONOMIC PROFILE OF DRIP IRRIGATION FARMERS IN SHIMOGA AND DAVANAGERE DISTRICTS OF KARNATAKA

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CERTIFICATE

This is to certify that the thesis entitled **"A STUDY ON SOCIO-ECONOMIC PROFILE OF DRIP IRRIGATION FARMERS IN SHIMOGA AND DAVANAGERE DISTRICTS OF KARNATAKA"** submitted by **Mr. SHASHIDHARA K. K.**, for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL EXTENSION EDUCATION**, to the University of Agricultural Sciences, Dharwad is a record of research work done by him during the period of his study in this university under my guidance and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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Introduction

I. INTRODUCTION

Land and water are the basic needs for agriculture and economic development of any country. No doubt High Yielding Varieties, use of fertilizers and pesticides and improved farming techniques have played a significant role, it would still have been difficult to realize the full potential of land without irrigation. Hence, irrigation has been responsible for the fast growth in agriculture and it will continue to be a major factor in future too.

In India, the cultivated land has stabilized at around 145 million hectares and is unlikely to increase further. The only answer to get as much production as possible from the available land is by growing as many crops as possible. Thus, the productivity of water assumes a greater significance in view of scarcity of water available for irrigation in the country. It is estimated that, if the entire surface and subsurface water resources are harnessed by 2010 A.D. it will be possible to irrigate only 115 million hectares, which is about 52 per cent of the total cultivated area at that time and the remaining area will continue to depend upon rainfall. Hence, it is necessary to economise and plan the use of every drop of water in agriculture. This could be achieved by sophisticated methods of irrigation like drip along with improved water management practices.

Drip or trickle irrigation technology developed by Symcha Blass, an Israeli engineer during early 1940's, is well established world over as the most efficient irrigation method, especially in water scarcity areas for most of the field, plantation, orchard, vegetable, forest and green/glass house crops. It has revolutionized the production of some of high value crops and other orchards in countries like Israel and else where especially when using saline

water. From a commercial beginning outside Israel in 1969, micro-irrigation in its current diverse form had been installed on some 11 million hectares throughout the world.

Drip irrigation is an efficient method of providing irrigation water directly into soil at the root zone of plants and thus, minimizes conventional losses such as deep percolation, runoff and soil erosion. Unlike surface irrigation, drip irrigation is more suitable and economical if it is introduced in water scarce areas having undulated topography, shallow and sandy soils and for wide spaced high value crops. It also permits the utilization of fertilizers, pesticides and other water-soluble chemicals along with irrigation water resulting in higher yields and better quality produce. Hence, drip irrigation system is regarded as panacea for many of the problems in dry land agriculture and improving the efficiency in irrigated agriculture.

Drip irrigation was introduced in India during seventies. The growth of drip irrigation in terms of area coverage has really gained momentum in recent years from a mere 1500 ha in 1985, the area has grown to 203500 ha at present. Karnataka is the second largest state (16767 ha) in the country next to Maharashtra (39924 ha) in the adoption of drip irrigation, (Appendix I). To promote drip irrigation system various schemes under Department of Agriculture and co-operation, Government of India are being implemented in the country. Introduction of subsidy by central and state governments, improvements in quality of raw materials used in drip irrigation systems, advancement in research technology and strengthened extension activities undertaken by the state governments, NCPA (National Committee on use of Plastic in Agriculture), PDCs (Plasticulture Development

Centers) and manufacturing units have all contributed to the acceleration of the area under drip irrigation from a mere 500 hectares during 1991 to about 92383.88 hectares by the end of 2000-01 (Anon., 2002).

The Department of Horticulture and Agriculture are the nodal agencies in Karnataka, releasing subsidy amount for drip irrigation for horticultural crops. Among horticultural crops coconut ranks first (27784 ha), followed by arecanut (11139 ha), mango (6286 ha), grapes (3983 ha), sapota (1139 ha) and to very small extent certain flowers and vegetables, (Appendix-I).

Considering the importance and growing demand for horticulture crops, there is a lot of scope for increasing the production of horticulture crops by increasing the yield per hectare through adoption of modern techniques such as drip irrigation.

In the process of achieving of higher productivity and better management, the personal, socio-economic, situational, technological and other characteristics of farmers play a vital role. Also unpredictable constraints may occur in adopting the system. At present a very few research studies have been conducted in India and abroad on knowledge and adoption behaviour of drip irrigation farmers.

In view of this it is very much essential to study the performance of drip irrigation system, the extent of knowledge and adoption of management practices, and the constraints with the drip irrigating farmers. Keeping all these in view the present study has been designed with the following specific objectives.

i. To study the personal, socio-economic and psychological characteristics of the drip irrigation farmers.

ii. To measure the extent of knowledge and adoption of drip irrigation management practices by the farmers.

iii. To study the extent of benefits derived from drip irrigation, and

iv. To identify the problems encountered by farmers in adoption of drip irrigation.

SIGNIFICANCE OF THE STUDY

In the present study main focus has been made to probe the drip irrigation management practices and the constraints in adoption of recommended practices. Further, an attempt has been made to study the extent of benefits derived through drip irrigation.

Thus, the findings of the study on the existing knowledge and adoption of management practices would help the concerned development departments and agencies to design appropriate educational programmes to educate the farmers in adoption of recommended practices. The identified constraints would also help to initiate appropriate measures by the agencies concerned. And above all the findings of the study help farmers to know an appropriate the extent of labour and water saved, increase in yield, and improvement in quality of produce as compared to surface irrigation methods.

LIMITATION OF THE STUDY

The limitations of time and other resources in the present investigation have restricted the selection of locale, sample size and the variables. Hence, the findings have to be viewed in the specific context of the conditions prevailing in the study area and cannot be generalized for a wider geographical area. However, careful and rigorous procedures have been adopted in carrying out the research as objectively as possible. In spite of the individual bias made by the respondent farmers in eliciting the necessary responses, it is believed that the findings and conclusions drawn in the present study would be the focus of more rigorous field observations.

Review of Literature

II. REVIEW OF LITERATURE

This chapter consists of research findings drawn from the review of literature pertaining to the present problem under investigation. Since, studies related to knowledge and adoption behavior of improved management practices with regard to plantation crops are few, in addition to the directly concerned literature other closely related studies were also reviewed. The entire reviews have been chronologically organized and presented under different heads as given below.

2.1 Personal, socio-economic and psychological characteristics of farmers

2.2 Knowledge level of farmers about the water management practices

2.3 Adoption behavior of the farmers about the water management practices

2.4 Benefits derived from drip irrigation, and

2.5 Constraints faced by the farmers in the adoption of drip irrigation.

2.1 PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL CHARACTERISTICS OF FARMERS

Age

Puranik *et al.* (1992) conducted a study on drip irrigation farmers in Nagpur district of Maharashtra and reported that 40.00 per cent of the non-adopter belonged to middle age group (36-50 years). Where as majority of adopted farmers (58.06 per cent) belonged to middle age group (36-50 years).

Yogananda (1992) in his study on coconut growers of Tumkur district in Karnataka revealed that 41.66 per cent of small land holders belonged to younger age group. Whereas, in case of big land holders the percentage of young age was only 28.34 per cent. A reverse trend was seen in case of old age group. And as much as 30.00 per cent of small landholders belonged to old age group.

Srinivasa Reddy (1995) in his study on mango growers of Kolar district in Karnataka reported that 55.00 per cent of the respondents belonged to middle age group, whereas 26.00 per cent belonged to old and 19.00 per cent belonged to young age group.

Saravana Kumar (1996) in a study on mango growers of Darmapuri district in Tamil Nadu observed that majority of respondents (59.17%) were in middle age, while 22.50 per cent and 18.33 per cent were in young and old age categories respectively.

Babanna (2001) conducted a study on arecanut growers in Shimoga district and stated that 38.40 per cent of growers belonged to old age, 35.00 per cent of them were middle aged and 26.60 per cent of the growers belongs to young age group.

Veda Murthy (2002) in his study on arecanut growers in Shimoga district focused that 25.33 per cent of the growers were old aged, 40.00 per cent of middle aged and 34.66 per cent were young aged group.

It could be inferred from the above studies that majority of the respondent farmers belonged to middle age group.

Education

Gotyal (1989) conducted a study on lime growers of Bijapur district in Karnataka state and reported that almost equal per cent (25%) of respondents were illiterate and educated upto primary school. Twenty per cent of the respondents were graduates. Only 16.00 per cent and 12.67 per cent studied upto high school and Pre-university respectively.

Jayale (1992) in a study on orange growers of Parbhani distirict of Maharashrtra observed that about 15.83 per cent of the respondents were illiterate, 18.33 per cent each were noticed in read only and read and write category, while 8.34 per cent each of the respondents were educated upto primary and middle school level. Nearly one fourth of the total respondents (22.50%) were studied upto high school and only 8.33 per cent of the respondents were graduates.

Phadtare *et al.* (1992) conducted study on drip irrigation farmers in Sangli district of Maharashtra and reported that most of the farmers received secondary and college education.

Puranik *et al.* (1992) in the study on drip irrigation farmers in Nagpur district of Maharashtra noticed that majority of the non adapting farmers were educated up to middle school and high school standard.

Srinivasa Reddy (1995) in his study on mango growers of Kolar district in Karnataka observed that 28.00 per cent of the respondents were educated upto high school, 25.00 per cent were illiterate and 19.00 per cent of the respondents studied upto primary school. And only 7.00 per cent of the mango growers had education upto graduation level.

Saravana Kumar (1996) revealed that 27.50 per cent of the mango growers of Dharmapuri district in Tamil Nadu had studied upto college level, 23.33 per cent and 9.16 per cent of the respondents were educated upto primary school and graduation respectively. Only 1.67 per cent of the respondents were illiterate.

Babanna (2001) in his study on arecanut growers of Shimoga district in Karnataka reported that 42.40 per cent of the farmers were educated upto 4th standard, and 39.20 per cent of the farmers had higher education level. Where as only 16.66 per cent of the respondents had very low education upto 2nd standard.

Veda murthy (2002) in his study on arecanut growers of Shimoga district in Karnataka noticed that 38.66 per cent of the farmers were studied upto high school. Almost equal per cent of farmers educated upto primary school (13.33 %) and college (14.66 %). Where as only 8.00 per cent of the respondents were illiterate and 6.66 per cent of the farmers were graduate.

From the above reviews it could be inferred that more number of respondent farmers had better education levels.

Land holding

Gotyal (1989) in his study on lime growers of Bijapur district in Karnataka revealed that 42.67 per cent of the respondents had 8.1 to 16 acres of land and very few (2.66%) respondents had more than 40 acres of land.

Lokhande (1990) observed that majority of grape growers (76.60%) of Osmanabad district in Maharashtra owned land upto 10 hectares, while 20.90 per cent owned land between 10 to 20 hectares. Where as very negligible per cent (2.50%) of the respondents possessed 20 hectares and above land holding.

Patalia (1991) conducted a study on mango cultivators of Parbhani district in Maharashtra and reported that 50.00 per cent of the respondents had small land holding upto 2 hectares and 47.50 per cent of the respondents had medium land holding ranging from 2.10 to 6 hectares. Only 2.50 per cent respondents had land holding above 6.10 hectares.

Jayale (1992) in his study on horticultural crops of Parbhani district in Maharashtra found that majority of the respondents (63.23%) had land holding upto 6 hectares and 23.33 per cent possessed small land holding upto 2 hectares. And only 13.34 per cent of respondents had land holding above 6.1 hectares.

Srinivasa Reddy (1995) conducted a study on mango growers of Kolar district and reported that nearly half of the total respondents (41.00%) had less than 12 acres of land and 36.00 per cent of the

respondents possessed 12 to 32 acres of land. Whereas, 23.00 per cent respondents had more than 32 acres of land.

Veda Murthy (2002) in his study on arecanut growers of Shimoga district in Karnataka reported that equal per cent (28.66%) of the respondents were noticed in large and marginal farmers category, where as 24.00 per cent of the respondents were medium and 18.66 per cent of the farmers were marginal farmers.

From the above studies it could be inferred that more number of farmers had medium land holdings.

Area under drip irrigation

Ananda (1992) conducted a study on drip irrigation efficiency in Bijapur district in Karnataka and reported that 31.67 per cent of them had one to two acres of drip irrigation, followed by two to three acres of drip irrigation possessed by 23.33 per cent. More than four acres of drip irrigation coverage was observed with 21.67 per cent, three to four acre among 16.67 per cent and less than one acres by 6.66 per cent of the farmers.

Phadtare *et al.* (1992) conducted a study on drip irrigating farmers in Sangli district of Maharashtra and reported that 54.54 per cent of the farmers possessed drip irrigation land below two hectare and 45.46 per cent of the farmers had 0.50 hectares of land under drip irrigation.

Innovative proneness

Ananda (1992) conducted a study on drip irrigation efficiency among grape growers of Banglore district in Karnataka and focused that

40.00 per cent of the drip irrigation adopters had medium innovative proneness, where as 30.00 per cent each were grouped under low and high innovative proneness categories.

Balasubramani (1997) conducted a study on rubber growers in Dakshina Kannada district in Karnataka and reported that 37.00 per cent were found in medium innovative proneness category followed by 35.00 per cent and 28.00 per cent in high and low innovative proneness category respectively.

Kumar (1998) conducted a study on banana growers in Banglore district in Karnataka and pointed out that 40 per cent of the banana growers had less innovative proneness followed by 37 per cent of them had medium and 23 per cent of them had high innovative proneness.

Babanna (2001) conducted a study on arecanut growers in Shimoga district in Karnataka and focused that 34.10 per cent farmers were of medium innovative proneness category followed by 33.33 per cent of them having high and 32.66 per cent of them possessed low innovative proneness.

It could be inferred from above studies majority of the farmers belonged to medium innovative proneness.

Risk orientation

Ajay Kumar (1989) in his study on grape growers of Rangareddy district in Andhra Pradesh found that an equal per cent of respondents had high (32%), low (33 %) and medium level of risk orientation (35%).

Ananda (1992) in the study conducted on grape growers of Banglore district in Karnataka indicated that 48.84 per cent of drip irrigation adopters had medium risk orientation followed by 38.33 per cent of high and 13.03 per cent of them had low risk orientation.

Puranik *et al.* (1992) conducted a study on drip irrigation farmers in Nagpur district of Maharashtra and reported that majority of farmers belonged to medium risk preference group.

Srinivasa Reddy (1995) in his study on mango growers of Kolar district in Karnataka revealed that 43.00 per cent of the respondents were in high risk orientation followed by low (31%) and medium (26%) risk orientation category.

Saravana Kumar (1996) observed that majority of the mango growers (70.83%) of Dharmapuri district in Tamil Nadu belonged to medium level of risk orientation followed by low (15%) and high (14.17%) level of risk orientation category.

Babanna (2001) conducted a study on arecanut growers of Shimoga district in Karnataka and pointed out that 37.50 per cent of arecanut growers belonged to medium category followed by 31.60 per cent of them had high risk orientation. The remaining 30.80 per cent of them were having low risk orientation.

Veda murthy (2002) in his study on arecanut growers of Shimoga district in Karnataka reported that 45.33 per cent of the areca growers belongs to medium category followed by 38.00 per cent of them had high risk orientation and 16.66 per cent possessed low risk orientation.

From the above reviews it could be inferred that majority farmers had medium risk orientation.

Annual income

Phadtare *et al.* (1992) conducted a study on drip irrigation farmers in Sangli district of Maharashtra and reported that out of every 10 farmers, six had annual income upto Rs. 50,000 while one fifth of farmers had income ranging from Rs. 50,000 to one lakh.

Chandran (1997) conducted a study on tapioca growers of Ernakulam district in Kerala and found that 33.33 per cent of the respondents belonged to low income category, while 40.00 and 26.67 per cent were under medium and high income category respectively.

Babanna (2001) in his study on arecanut growers of Shimoga district in Karnataka revealed that 61.60 per cent of the respondents belonged to medium income category while 23.40 and 15.00 per cent were under low and high income category respectively.

Veda murthy (2002) in the study on arecanut growers of Shimoga district in Karnataka noticed that 48.66 per cent of the respondents belong to high income category, while 34.00 per cent and 17.34 per cent were noticed in medium and low income category respectively.

Scientific orientation

Ajay Kumar (1989) conducted a study on grape growers of Ranga reddy district in Andhra Pradesh and reported that 56.00 per cent of the respondents had high level of scientific orientation. Where as 21.00 and

23.00 per cent of the respondents had medium and low level of scientific orientation respectively.

Puranik et al. (1992) in a study on drip irrigation farmers of Nagpur district, Maharashtra observed that majority of the farmers who did not adopt drip irrigation system were found in medium scientific orientation group

Saravana Kumar (1996) in his study on mango growers of Dharmapuri district in Tamil Nadu observed that majority of the respondents (70%) belonged to medium scientific orientation category, followed by low (15.83%) and high (14.17%) level of scientific orientation category.

Chandran (1997) conducted a study on tapioca growers of Ernakulum district of Kerala and reported that 31.67 per cent of the respondents belonged to low scientific orientation category. Thirty per cent and 38.33 per cent of the respondents were respectively belonged to medium and high scientific orientation category.

Veda murthy (2002) in the study on arecanut growers of Shimoga district in Karnataka focused that 48.33 per cent of the respondents were noticed in medium scientific orientation, where as 32.00 per cent and 22.66 per cent of the respondent belong to low and high scientific orientation respectively.

Based on these reviews it would be inferred that majority of the farmers had medium to high level of scientific orientation.

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Social participation

Srinivasa Reddy (1995) conducted a study on Mango growers in Kolar district of Karnataka and reported that 57.00 per cent of the mango growers had medium level of social participation followed by 33.00 per cent with low level and 10.00 per cent with high social participation.

Balasubramani (1997) in a study on rubber growers of Dakshina Kannada district in Karnataka pointed out that 53.00 per cent of participants had medium level of social participation followed by low and high social participation with 37.00 per cent and 20.00 per cent of respondents respectively.

Kumar (1998) in his study on banana growers in Banglore district of Karnataka reported that 53.00 per cent had low social participation, followed by medium (27%) and high (20%) social participation.

From the above reviews it cold inferred that more number of farmers had medium social participation.

Mass media participation

Ajay Kumar (1989) reported that cent per cent of the grape growers of Ranga reddy district in Andhra Pradesh possessed radio and also subscribed to newspapers. About 83.00 per cent possessed television sets and only 11.00 per cent of the respondents subscribed to farm magazines.

Gotyal (1991) in his study on lime growers of Bijapur district in Karnataka revealed that majority of the respondents (77%) possessed radio, 28.00 and 5.00 per cent of the respondents were subscriber of newspapers and magazines respectively. About 79.00 and 71.00 per cent

of the respondents never made use of farm magazines and literature related to horticultural crops, respectively.

Srinivasa Reddy (1995) pointed out that majority of the mango growers (53%) of Kolar district in Karnataka had low level of mass media participation followed by high (36%) and medium (11%) level of mass media participation.

Saravana Kumar (1996) noticed that cent per cent of mango growers of Dharmapuri district in Tamil Nadu possessed radio of which 42.50 per cent of them listened to agricultural programmes regularly. Whereas, 46.67 per cent of the respondents had television, of which 24.00 per cent viewed the agricultural programmes regularly.

Chandran (1997) in the study on tapioca growers of Ernakulum district in Kerala found that 75.00 per cent of the respondents subscribed to news paper, radio was possessed by 95.00 per cent and 56.66 per cent possessed television. Further researcher observed that 86.66 per cent of farmers were regularly reading literature on agriculture/allied aspects, 71.66 per cent of the respondents listened to agricultural programmes on radio and 66.66 per cent of the respondents viewed the agricultural programmes telecasted on television.

Babanna (2001) conducted a study on arecanut growers of Shimoga district in Karnataka and reported that 45.80 per cent had utilised the sources like radio, followed by viewing television programmes to the extent of 33.40 per cent, where as Newspapers and magazines were used by 20.00 per cent of the respondents only.

Veda Murthy (2002) in his study on arecanut growers of Shimoga district in Karnataka observed that relatively a more number of growers (48%) were medium mass media users. While 37.00 per cent had high mass media use, and 27.33 per cent were of low mass media users.

From these reviews it is clear that majority of the respondents had medium level of mass media participation.

2.2 KNOWLEDGE LEVEL OF FARMERS ABOUT WATER MANAGEMENT PRACTICES

Ananda (1992) in a study on drip irrigation in Banglore district of Karnataka found that 48.34 per cent of the drip irrigation adopted grape growers were noticed in medium efficiency of drip irrigation, followed by 28.33 per cent with high efficiency and 23.33 per cent in low efficiency category.

Kumar (1998) in his study on banana growers in Banglore district in Karnataka revealed that 89.00 per cent of the farmers had correct knowledge about the recommended irrigation interval.

Raghavendra (1997) conducted a study on arecanut growers of South Canara district in Karnataka and reported that 27.00 per cent of arecanut growers possessed knowledge about irrigation interval.

Shivamurthy (1991) conducted a study on arecanut and cardamom growers in Shimoga district of Karnataka and reported that 74.17 per cent of the respondents had knowledge about water management practices.

Dalvi *et al.* (1993) in a survey of 42 drip system in Maharashtra in 1990, revealed that around fifty per cent of farmers lack the knowledge of

scheduling irrigation (52%) and chemicals used to remove clogging (48%), followed by analysis of soil and water test (38%) and method of measuring pressure/discharge (16%) in the operating of drip system.

Babana (2001) carried out a study on arecanut growers in Shimoga district of Karnataka and reported that 41.60 per cent had correct knowledge about the recommended irrigation interval.

Veda Murthy (2002) in a study on arecanut growers in Shimoga district in Karnataka revealed that only 33.66 per cent respondent had correct knowledge about the recommended irrigation interval.

From the above studies it could be inferred that in majority of the studies, the respondents had medium level of knowledge about irrigation management practices.

2.3 ADOPTION BEHAVIOR OF FARMERS ABOUT WATER MANAGEMENT PRACTICES

Shivamurthy (1991) conducted a study on arecanut and cardamom growers in Shimoga district of Karnataka and reported that relatively more number of respondents (55%) were not adopted the irrigation management practices however 27.50 per cent and 17.50 per cent of the respondents were noticed in complete and partial adoption of the drip irrigation management practices respectively.

Yogananda (1992) carried out a study on coconut growers of Tumkur district in Karnataka and indicated that majority of the small farmers did not adopted recommended time of irrigation interval, where as 23.33 per cent and 13.33 per cent of them were noticed in complete and

partial adoption category respectively. On contrary more number of farmers (58.33%) adopted the recommended time of irrigation interval followed by 23.33 per cent and 18.33 per cent in partial and not adoption category respectively.

Raghavendra (1997) conducted a study on arecanut growers of South Canara district in Karnataka and revealed that 68.00 per cent of the respondents had completely adopted the recommended management practices, where as 32.00 per cent were found partially adopted.

Kumar (1998) in his study on banana growers in Banglore district of Karnataka reported that 88.00 per cent of farmers were found to adopt irrigation method as recommended.

Babana (2001) carried out a study on arecanut growers in Shimoga district in Karnataka and revealed that 75.55 per cent of respondents had completely adopted the recommended irrigation management practices, where as 22.55 per cent were found partially adopted

Veda Murthy (2002) in a study on arecanut growers in Shimoga district in Karnataka and reported that only 32.66 per cent of respondents were adopted the recommended irrigation interval.

The above studies bring to inference that a high majority of farmers were found to not adopt the recommended irrigation management practices, and a lesser per cent in a complete and partial adoption of recommended practices.

2.4 BENEFITS DERIVED THROUGH DRIP IRRIGATION

Abdul Khadar (1988) in an experiment on comparative benefits of drip system over check basin method in arecanut crop of CPCRI, Vittal in Karnataka, reported that drip irrigation has increased all the vegetative and reproductive growth parameters like height, growth, number of nodes, leaf area, number of spadices, percentage of nut and saving of 44 per cent water through drip irrigation.

Kandaswamy (1990) identified that the water required for grape and banana cultivation under drip system was only 1/3 to 1/4 of the surface method, thus the water saving to the extent of 50.00 per cent over control shown however the yield on par with surface system.

Patil (1990) observed the following growth and yield parameters in banana crop as influenced by drip v/s surface irrigation.

Growth and yield parameters	**Drip irrigation**	**Surface irrigation**
Average days for harvesting	397.85	433.59
Average number of hands per bunch	10.56	8.86
Average number of fingers per bunch	159.41	138.34
Average length of finger (Cm)	18.30	17.50
Average girth of finger (Cm)	14.10	12.80
Average bunch weight (kg)	17.95	14.23
Average yield per hectare (ton/ha)	79.77	63.24

Further the results highlighted 26.14 per cent increased yield, 55.00 per cent saving of water and very negligible intensity of weeds by drip irrigation as compared to flow irrigation.

Sivanappan (1991) reported that in drip irrigation the water saving was about 50-70 per cent and the yield increased by 10-100 per cent from various crops. He also observed other advantages like decreased tillage, high quality produce, higher fertilizer efficiency and less weed growth.

Phadtare *et al* (1992) in a study on drip irrigation farmers in Sangli district of Maharashtra reported that all the adopters of the drip irrigation had revealed the benefits like water saving, labor saving and increased crop yield.

Ananda (1992) conducted a study on drip irrigation efficiency among grape growers in Banglore district in Karnataka and reported that there was an increase of 7.99 per cent in gross returns under drip irrigation. There was significant increase in net return to an extent of Rs. 6,575/- under drip irrigation, which was 16.13 per cent more than the surface irrigation probably due to considerable saving of Rs.1,682.61/- in cost of production under drip irrigation which was 7.77 per cent less than the cost of production under surface irrigation. The benefit cost ratio's for drip and surface irrigation system were 3.44:1 and 2.94:1 *respectively*. Thus, there was an additional income of Rs. 0.50 for every rupee invested under drip irrigation.

Patil *et al* (1993) carried out a study in Rahuri district of Maharashatra to know the comparative benefits of furrow and drip

irrigation method in banana crop and indicated that the drip method showed good results in extending self life (3-4 days) and yield (68.57 tons/ha) of banana as compared to furrow method of irrigation which yielded 62.52 tons/ha.

Pampattiwar *et al* (1993) in their research study on pomegranate growers in Rahuri district of Maharashtra reported that drip irrigation has given 13.00 per cent increased yield (60.69 q/ha) as compared to surface irrigation method (43.98 q/ha)

Sahoo *et al.* (2000) noticed that the adoption of drip irrigation in coconut crop in Puri district of Orrisa were getting uniform growth of coconut plants than the traditionally irrigated ones. Benefit cost ratio in drip irrigated coconut, mango and sapota were more than that under traditional irrigation method.

Alam and Ashwani Kumar (2001) in a study on relative performance of banana crop with drip irrigation highlighted the higher banana yields of crop grown under drip irrigation at Bhawanisagar (329 qt/ha), Kharagpur (400 qt/ha) and NCPA (875 qt/ha) as compared to surface irrigation yields (277, 290 and 575 qt/ha respectively) as shown the increased yields to the extent of 15.8 per cent, 27.5 per cent and 34.3 per cent respectively with saving of water 7.5 per cent, 13.00 per cent and 48 per cent respectively.

Muthuchamy *et al.* (2001) in a study on areca growers in Combiatore district in Tamil Nadu indicated that drip irrigation has recorded the highest nut yield of 133 nuts/tree/year as compared to 124 nuts/tree/year in conventional basin irrigation. Adoption of drip irrigation

also resulted in water saving to the tune of 59.00 per cent and labor saving to the extent of fifty per cent when compared to basin method of irrigation.

Kannaiyan (2001) reported that drip irrigation has resulted in significant water saving to the tune of 40-70 per cent with yield increase as high as 100.00 per cent in various crops. The study also indicated nutrient use efficiency and 20-25 per cent reduction in fertilizer doses.

Shiva Kumar *et al.* (2001) reported the advantages of drip irrigation like avoiding loss to conveyance seepage and loss of water from unwanted area in the field. They also pointed out the other benefits of higher efficiency of water and land use, saving of fertilizers and power, increased yield and quality produce, reduction in pest and disease menace. The advantages of clubbing the practices like fertigation, herbigation and chemigation operation along with irrigation were also reported.

Sivanappan (2002) has reported the advantages like judicious use of water, uniform application of water at low application rate, enhanced plant growth and yield, reduced salinity hazards to crops, reduced weed growth and operational labor cost, controlled root zone environment, adoptability to different terrain and problematic soils and improved quality of production.

From the above reviews it could be inferred that water saving, saving of labour, quality produce, less weed growth, increased yield, water use efficiency and higher fertilizer use efficiency the major benefits of drip irrigation system.

2.5 CONSTRAINTS FACED BY DRIP IRRIGATION FARMERS

Phadtare *et al.* (1992) conducted study on drip irrigation farmers in Sangli district of Maharashtra and pointed out the social constraints like non-availability of repair services, delay in disbursement of subsidy and lack of faith of elder family members about drip irrigation. The major economic constraints faced by farmers were delay in getting loan, and lack of capital for covering all area under drip irrigation The study also highlighted the important technical constraints like not aware of benefits of drip irrigation, not convinced of the importance of drip irrigation and non-availability of technical guidance in time.

Dalvi *et al.* (1993) in a study of 42 drip system in Maharashtra in 1990 highlighted the major technical constraints like difficult to operate (62%), emitter clogging (35%) and leakage of dripper and laterals joints (33%).

Sheeba and Balraj (1998) conducted a research study on drip irrigation farmers of Killikulam in Tamil Nadu and reported that the recommended application of potassic and phosphatic fertilizers in the system had lead to clogging of emitters.

Batta and Singh (2000) in a study on drip irrigation farmers in Rahuri district of Maharashtra reported the socio economic constraints like high initial cost of the system, procedural difficulties in availing the subsidy by the government, clogging of micro tubes. They also observed that farmers were dissatisfied due to clogging of drippers, leakage of drippers from lateral jointing, leakage from lateral sub main jointing,

non-uniform discharge from drippers, biting of lateral/micro tubes by rodents, and difficulty in inter culture operations and taking out the drip system laterals during crop harvest.

Based on these reviews it could be inferred that clogging of emitters, non-availability of technical guidance in time, breakage of the laterals, non-availability of quality material, high initial cost, delay in availing of subsidy and loan, soil salinity, non-availability of services by the agency or technical departments were the major constraints in adoption of recommended management practices in drip irrigation system.

Material and Methods

III. MATERIAL AND METHODS

The study was conducted during 2002-2003 in Shimoga and Davanagere districts of Karnataka. The research methods and techniques followed in the study are detailed under the following heads.

3.1 Locale of the study.

3.2 Research design

3.3 Selection of the study area.

3.4 Brief description of the study area

3.5 Selection of the respondents

3.6 Selection of variables.

3.7 Operanilization and measurement of variables

3.8 Development of interview schedule

3.9 Statistical methods used to analyse the data.

3.10 Definition of terms & concepts

3.1. LOCALE OF THE STUDY

The present study was conducted in Shimoga and Davanagere districts of Karnataka. From these two districts Shimoga, Shikaripura, Channageri and Honnalli taluks were purposively selected based on maximum drip irrigated area in plantation crops. (Table 1 & 2).

3.2 RESEARCH DESIGN

In the present investigation, an Ex-post-facto research design was considered as appropriate because the phenomenon had already occurred.

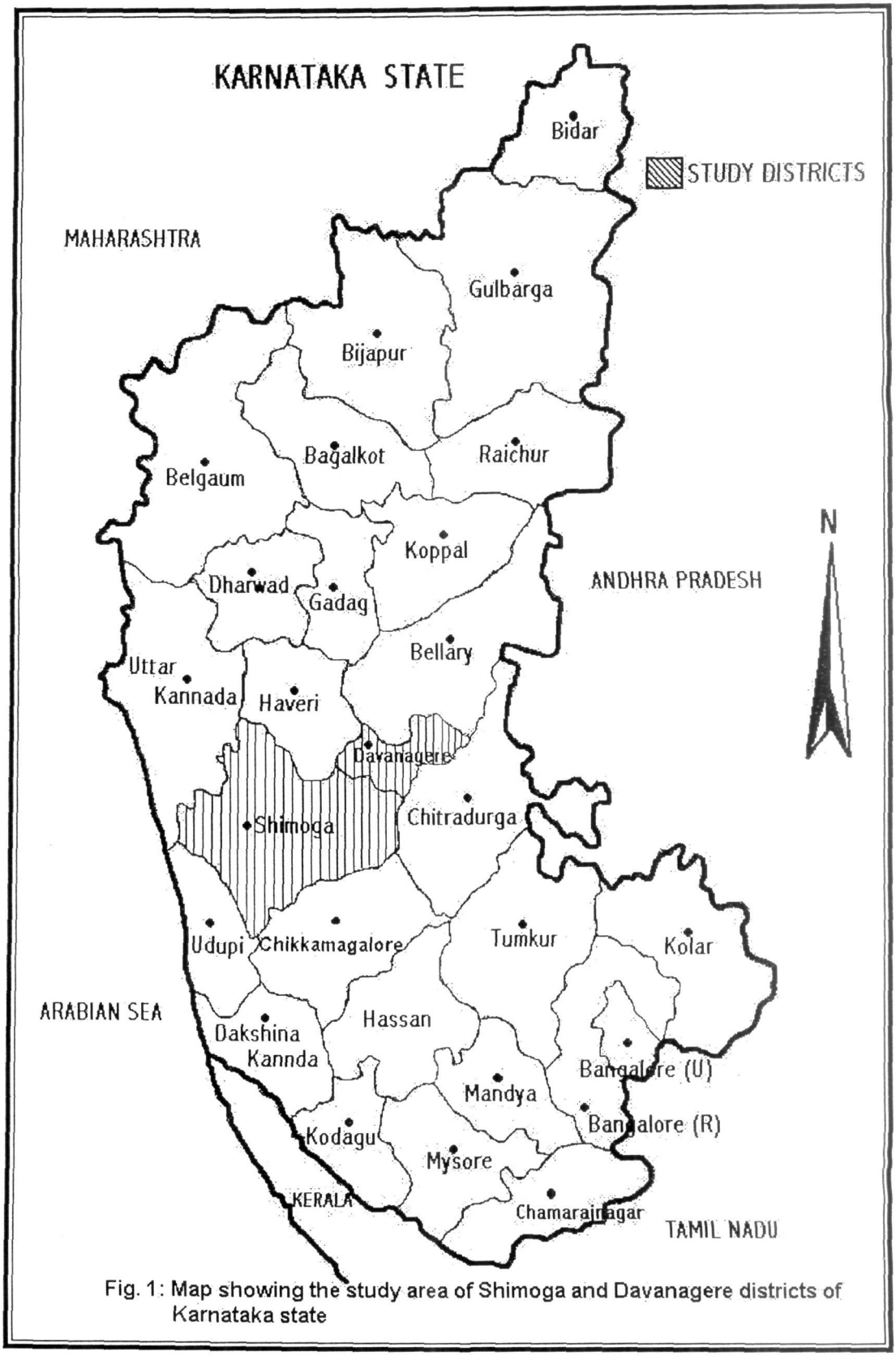


Fig. 1: Map showing the study area of Shimoga and Davanagere districts of Karnataka state

3.3 SELECTION OF THE STUDY AREA

The drip irrigation area spread over Shimoga and Davanagere districts, where in Maximum plantation crop area under drip irrigation exists have been selected for the study. Shimoga district consists of seven taluks, among these Shikaripura (391.60 ha) stands first followed by Shimoga (361.32 ha) in adoption of drip irrigation in the year of 2001-2002 (Table-1). Similarly in Davanagere district, of the six taluks, Channageri (1053.96 ha) stands first in adoption of drip irrigation followed by Honnalli (100.47 ha) during 1999-2000. Hence, these taluks were selected purposively for the research study (Table-2).

3.3.1 Selection of villages

The farmers having drip irrigation in all the villages coming under Shimoga, Shikaripura, Channagiri and Honnalli taluks were listed after obtaining the information from the officers of the Department of Horticulture and the dealers of drip irrigation. Considering the more number of drip irrigation farmers 23 villages were selected (Table 3a). To compare the quality parameters obtained by drip irrigation method, 30 banana growers who followed surface method irrigation were selected for the study (Table 3b).

3.4 BRIEF DESCRIPTION OF THE STUDY AREA

Shimoga district situated in southern transitional zone of Karnataka is basically a malnad area and it consists of seven talulks. The district lies between 13^0 56' North latitude and 75^0 30' east latitude. This is

Table: 1 Physical progress of drip irrigation in Shimoga district of Karnataka during 2001-02

Taluks	Area (ha)
Shimoga	361.32
Bhadravathi	360.12
Shikaripura	391.60
Sorab	181.19
Sagar	89.69
Hosanagar	138.63
Thirthahalli	73.45

Source: Anonymous (2002)

Table: 2 Physical progress of drip irrigation in Davangare district of Karnataka during 1999-2000

Taluks	Area (ha)
Channagiri	1053.96
Honnalli	100.47
Davanagere	NA
Harihar	45.25
Harapanahalli	95.12
Jagalur	NA

Note: NA- Not available
Source: Anonymous (2002)

Table 3a: District, Taluka and village wise selection of drip irrigation farmers for the study

District	Taluka	Villages	Number of drip irrigation farmers	Number of respondents Selected
Shimoga	**Shimoga**			
		Abblegere	58	7
		Kommnal	75	4
		Haramaghatta	215	9
		Sominakoppa	110	4
		Aladhahalli	69	3
		Hargoppa	159	2
	Shikaripura			
		Neralagi	48	1
		Muchidi	28	3
		Sunadhakoppa	42	4
		Nandhihalli	53	3
		Bhadrapura	30	2
		Shikaripura	12	2
		Mullakoppa	23	4
		Hullinakoppa	15	3
		Thralaghatta	19	2
		Anjanapura	10	3
Davanagare	**Channageri**			
		Rajagondanahalli	150	6
		Goppanahalli	115	6
		Pondumatti	130	3
	Honnalli			
		Surahonne	18	6
		Namathi	24	3
		Doddari	35	7
		Thimalapura	13	6
Total			**1451**	**90**

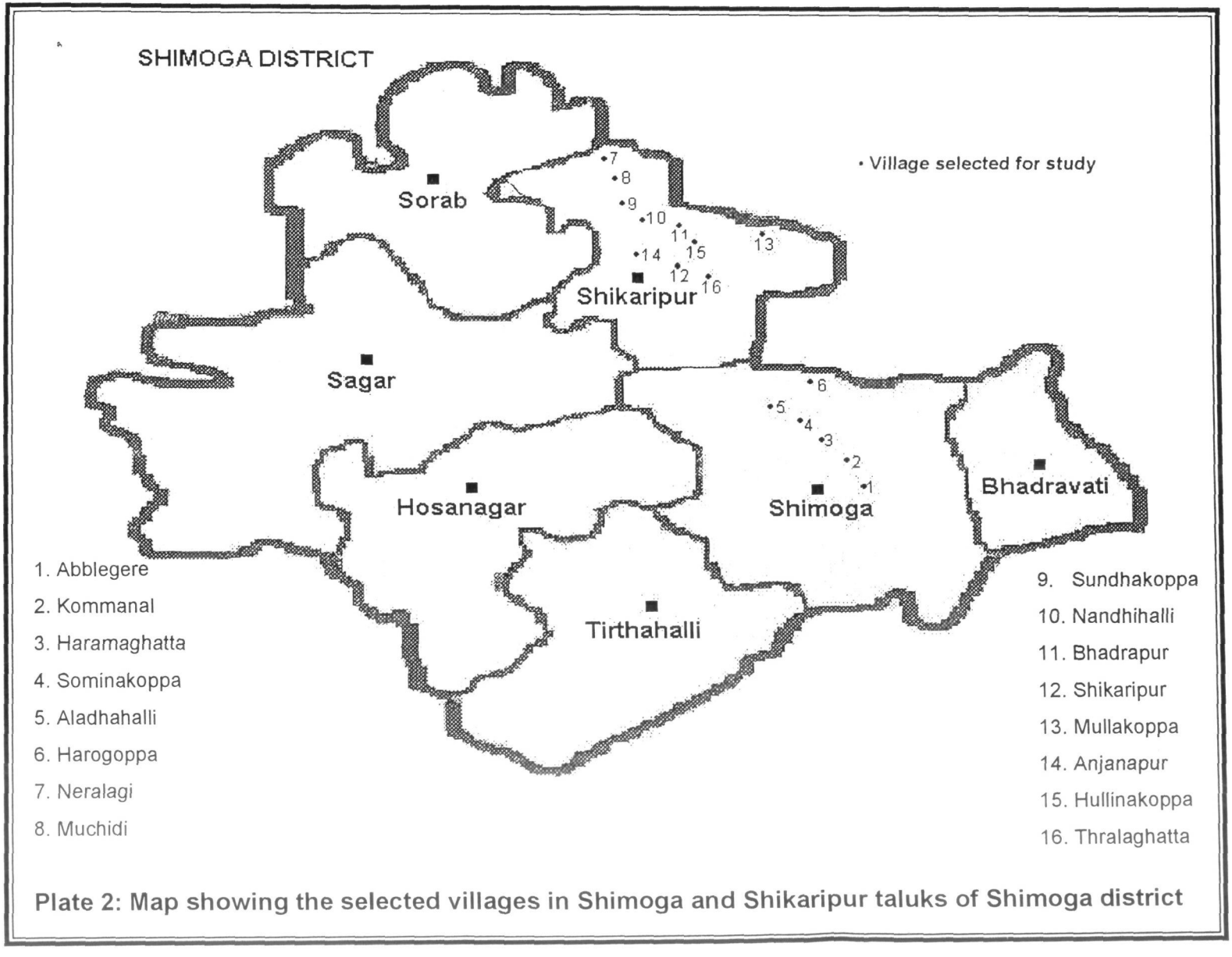
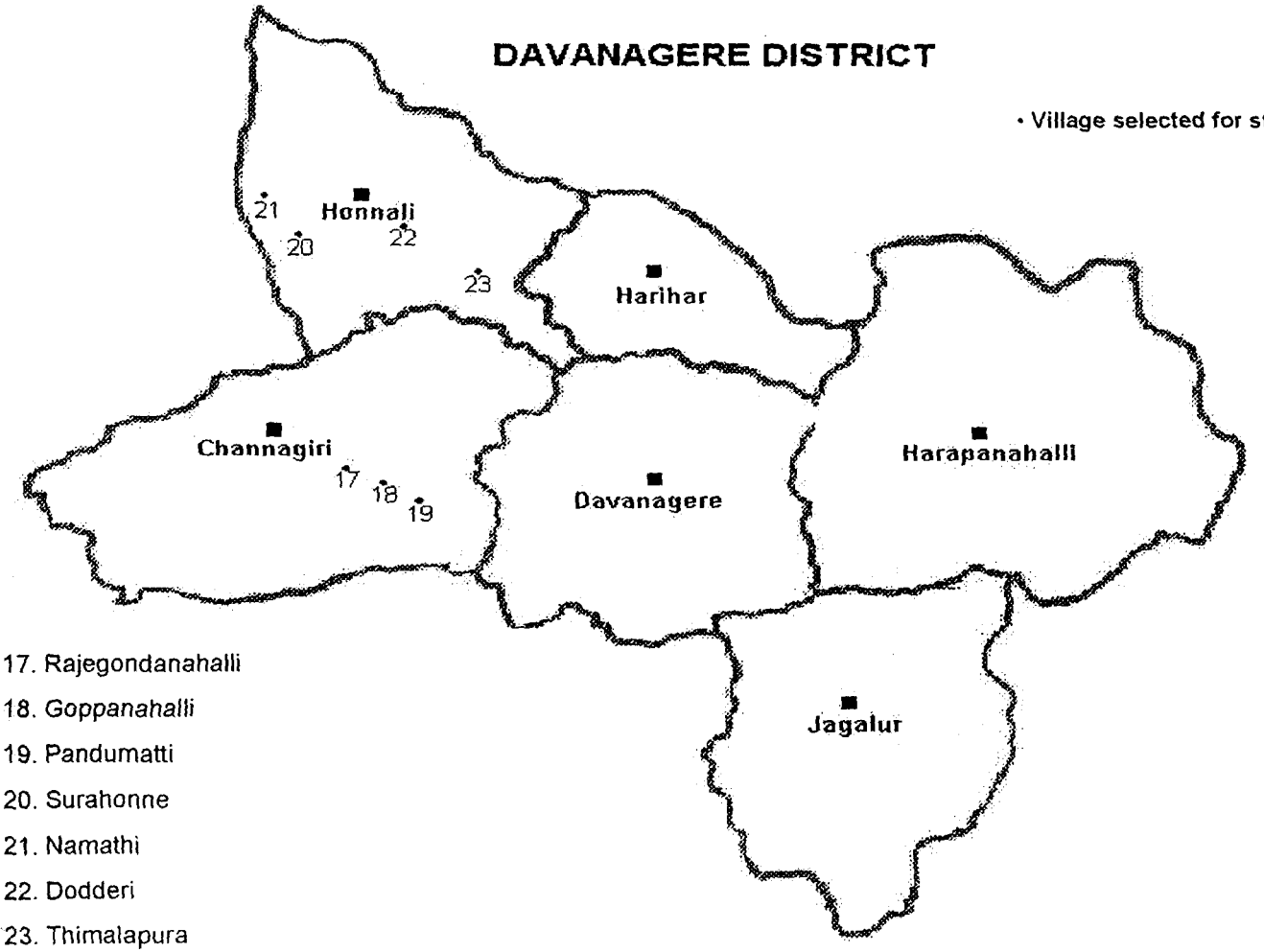


Plate 2: Map showing the selected villages in Shimoga and Shikaripur taluks of Shimoga district



17. Rajegondanahalli
18. *Goppanahalli*
19. Pandumatti
20. Surahonne
21. Namathi
22. Dodderi
23. Thimalapura

Plate 3: Map showing the selected villages in Channagiri and Honnali taluks of Davanagere district

Table 3b: Selection of surface irrigation farmers for the study

Taluk	Villages	No. of respondents selected
Shimoga	Theverachatnahalli	6
	Gondhichitnahalli	6
	Doddari	6
	Holalur	6
	Hanasavadi	6
	Haramaghatta	6
	Total	**30**

surrounded by Haveri district in north, Chickmanglore district in south, Davanagere district on east and Udapi on west.

The total geographical area of the district is 846500 ha of which 342987 ha is the net sown area. The total population of the district was 1639595 with literacy rate of 74.86 per cent.

The average rainfall of the district is 1833 mm of which 90 per cent is recorded during southwest monsoon (June-Sept) and the rest occurs during summer and winter seasons. The district irrigated by Tunga and Bhadra cannels covers 174077ha under irrigation. The sources of irrigation are Tanks (6690 ha), Wells (5887ha), Tube wells (15584 ha) and Lift irrigation (2351 ha).

Shimoga district predominantly has gravelly red and sandy soil and also to some extent of black soil. Areca nut, Coconut, Banana and Paddy predominately grown in irrigated area. Where as cotton, Cardamom, Groundnut, Sorghum and Maize are the major rain fed crops. The area under horticulture crops is 6779 ha with production of 23,862 thousand tons.

Davanagere district coming under Central dry zone of Karnataka, which consists six taluks. The district lies between 14^0 to 15^0 North latitude and 75^0 50' to 76^0 50' East attitude. This is bounded by Bellary and Haveri districts in north, Chickmanglore district in southern side, Chitradurga in east and Shimoga on the western side.

The total geographical area of the district is 601800 ha of which 380000 ha under is cultivable area. The total population of the district is 1789693 with literacy rate of 67.67 per cent.

The average rainfall is 644 mm of which 95 per cent is recorded during southwest monsoon (June-Sept) and the remaining during summer and winter seasons. In the predominant red and sandy soil major crops being grown are Paddy, Areca nut, Cotton, Coconut, Jowar and Maize. The Tunga and Bhadra canals were irrigated an area of 1,19,030 ha where in Paddy, Areca nut and Coconut crops are predominantly grown. The area under horticulture crops is 1,30,444 ha with a production of 76345 thousand tons.

3.5 SELECTION OF RESPONDENTS

By using random sampling method 90 drip irrigation farmers (Table 3a) and 30 surface irrigation farmers were selected for the study (Table 3b).

3.6 SELECTION OF VARIABLES

3.6.1 Dependent variables

In the light of the objectives set for the study the dependent variables considered were

1. Knowledge of drip irrigation management practices
2. Adoption of drip irrigation management practices

3.6.2 Independent variables

Based on review of literature and discussion with Scientists of UAS Dharwad and extension functionaries of Department of Horticulture and drip

irrigation agency the following independent variables were selected for the study.

1. Age
2. Education
3. Land holding
4. Family income
5. Area under drip irrigation
6. Mass media participation
7. Organisational participation
8. Risk orientation
9. Scientific orientation
10. Innovative proneness

3.7 OPERATIONALZIATION AND MEASUREMENT OF VARIABLES

3.7.1 Dependent variables

3.7.1.1 Knowledge level of drip irrigation management practices

In the present study, the knowledge of drip irrigation management practices is operationlised as the factual information possessed by the drip irrigation farmers regarding the practices to be followed before installation of drip system and also during and after the installing of drip system at the time of interview.

Construction of Knowledge test

A teacher made test procedure was followed to measure the knowledge level of drip-irrigating farmers about selected management

practices. A list of management items relating to drip irrigation were carefully framed in consultation with the irrigation experts and State Department of Horticulture and drip irrigation agencies. The correct response was given a score of one and incorrect response was given a zero score.

$$\text{Knowledge index} = \frac{\text{Number of correct responses}}{\text{Total number of knowledge items}} \times 100$$

Thus after computing the knowledge scores, the respondents were grouped into high, medium and low categories by considering the mean and standard deviation as a measure of check.

3.7.1.2 Adoption of management practices

This has been operationlized as the extent of adoption of selected recommended management practices before, during and after the installation of drip system by the drip irrigation farmers.

The adoption behavior of the respondents was measured by using the pre-tested list of practices, which have impact on determining the efficiency of the system. Later the responses were quantified as given by Sengupta (1967).

$$\text{Adoption quotient} = \frac{\text{Adoption score of the respondents}}{\text{Maximum adoption score one could get}} \times 100$$

The partial adoption techniques suggested by Sinha and Kolte (1974) was followed for scoring the practices, which were partially followed by the respondents.

The following scoring method was followed for scoring the practices of different levels of adoption.

Level of adoption	Score
Full adoption	2
Partial adoption	1
Non-adoption	0

Adoption quotient was converted into total adoption quotient depending on the total score obtained by each one of the respondents. They were grouped into high, medium and low adoption categories by taking mean and standard deviation as a measure of check.

3.7.2 Independent variables

1. Age

It refers to the chronological age of the respondents in completed years. The respondents were further classified as under.

Category	Age
Young	up to 35 Years
Middle	36 to 50 Years
Old	Above 50 Years

2. Education

It is operationlized as the number of years of formal schooling completed by the respondent. The respondents were grouped into different categories as under.

Category	Level of education
Illiterate	Cannot read & write
Primary school	1 to 4th standard
Middle school	5th to 7th standard
High school	8th to 10th standard
Pre-university	11th and 12th standard
Graduate	Above 12th standard

3. Land holding

Land holding of the individual respondents was expressed in terms of standard dry land acres as suggested by the Ministry of Rural Development circular no.280-12/6/19-1 Rural Development –111(Vol-V) dated 15th November 1991. (Anonymous, 1992).

Category	Land holding
Marginal farmers	up to 2.50 acres
Small farmers	2.50 to 5.00 acres
Semi medium farmers	5.01 to 10.00 acres
Medium farmers	10.01 to 25.00 acres
Big farmers	> 25.00 acre

4. Family income

Family income is the total annual income obtained by family during the year.

The annual income earned by the respondents was assessed considering income derived from agriculture and income obtained from subsidiary enterprises during the year.

. Respondent's annual incomes were rounded off to thousand rupees as the annual income score and were categorized based on the mean and standard deviation.

Category		Rupees
Low	(Mean - ½ SD)	< 1 lakh
Medium	(Mean ± ½ SD)	1 lakh to 2 lakhs
High	(Mean+ ½ SD)	> 2 lakhs

5. Area under drip irrigation

Area under drip irrigation is the total area irrigated by drip irrigation irrespective of the crop grown by the respondents. The respondents were grouped into three categories based on the mean and standard deviation.

Category		Score
Low	(Mean - ½ SD)	up to 2.50 acres
Medium	(Mean ± ½ SD)	2.51 – 8.00acres
High	(Mean + ½ SD)	8.01 & above

6. Organisational participation

It is the degree of involvement of the respondent from mere membership to organizational position and their active participation in the

activities of formal organizations. Farmers were asked to indicate their membership and office bearer in each of the organizations viz.,

1. Village panchayat
2. Taluk panchayat
3. Zilla panchayat
4. Co-operative society
5. Others (to specified)

The scoring pattern for participation in these activities follows as under.

Items	**Score**
Member ship	1
Office bearer	2
Participation	**Score**
Regularly	2
Occasionally	1
Never	0

Based on the score obtained by each respondent they were grouped into low, medium, and high categories taking mean and standard deviation as a measure of check.

Category		**Score**
Low	(Mean - 1/2 SD)	up to 1.50
Medium	(Mean ± 1/2 SD)	1.50 to 4.00
High	(Mean + 1/2 SD)	4.01 and above

7. Mass media Participation

In order to asses the extent of mass media participation by the respondents the different mass media sources were listed and the respondents were asked to indicate as to how often they utilizes these media. The scoring procedure as suggested by Trivedi (1968) was followed for quantification.

Items	**Score**
i. Reading of publications	
a. Regularly	2
b. Occasionally	1
c. Never	0
ii. Listening of radio programmes	
a. Regularly	2
b. Occasionally	1
c. Never	0
iii. Viewing behaviour of TV programmes	
a. Regularly	2
b. Occasionally	1
c. Never	0

Based on the score obtained by each respondent, respondents were grouped into low, medium and high categories taking mean and standard deviation as a measure of check.

Category		Score
Low	(Mean - 1/2 SD)	up to 2.5
Medium	(Mean ± 1/2 SD)	2.51 to 4.00
High	(Mean + 1/2 SD)	4.01 and above

8. Risk orientation

It refers to the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the problems in farming.

Risk orientation was measured with the help of risk orientation scale developed by Supe (1969). The items were rated on a five point continuum ranging from strongly agree, agree, undecided, disagree and strongly disagree with weightages of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4 and 5 for negative items respectively. The mean risk orientation score of the respondents was considered for categorizing the respondents into low, medium and high-risk orientation.

Category		Score
Low	(Mean - ½ SD)	up to 16
Medium	(Mean ± ½ SD)	17 to 18
High	(Mean + ½ SD)	19 & above

9. Innovative proneness

It refers to the behavior pattern of an individual who has interest and desire to seek change in farming techniques and ready to introduce such changes into his operations when practical and feasible.

Moulik's (1965) self-rating innovation proneness scale was used to measure the innovative proneness of a farmer. The respondents were categorized into three categories viz., high, medium and low based on mean and standard deviation as measure of check.

Category		**Score**
Low	(Mean - ½SD)	up to 18
Medium	(Mean ± ½ SD)	19 to 20
High	(Mean + ½ SD)	21 and above

10. Scientific orientation

It refers to the degree to which an individual is inclined to use scientific method in decision-making and farming.

Scientific orientation was measured with the help of scientific orientation scale developed by Supe (1969). The responses for each statement were rated on five point continuum ranging from "strongly agree", "agree", "undecided", "disagree" and "strongly disagree" with the scores of 5,4, 3, 2 and 1 for the positive statements and 1, 2, 3,4 and 5 for the negative statement, respectively. The total score of scientific orientation for each individual were added and the respondents were grouped into three categories using mean and standard deviation.

Category	**Scores**
High (Mean + ½ S.D.)	up to 16
Medium (Mean ± ½ S.D.)	17 -18
Low (Mean - ½ S.D.)	19 and above

3. 7.3 Quantification of benefits through drip irrigation

To identify the probable benefits in the adoption of drip irrigation by drip irrigation farmers, they were asked to indicate the benefits like technological, economical and situational by adopting drip irrigation. The various benefits indicated by the respondents were quantified by using frequencies and the percentages. While analyzing the quality parameters like length of fruit tape was used and thickness of fruit was measured by using verniear calipers.

3.7.4 Quantification of constraints faced by the drip irrigation farmers

To identify the probable constraints in the adoption of drip irrigation, the drip irrigation adopters were asked to indicate the probable constraints in the adoption of drip irrigation. The different constraints indicated by the respondents were quantified by using frequencies and their percentages were worked out.

3.8 DEVELOPMENT OF INTERVIEW SCHEDULE AND DATA COLLECTION

Keeping in view the objectives and variables under study, a structured interview schedule was prepared by consulting the previous research studies, discussing with experts and professional workers in the field of Agricultural Extension Education, Agricultural Engineering and Horticulture. The interview schedule was pre-tested with a sample of ten farmers who were not included in the final sample. The final schedule was prepared by necessary modifications, additions and deletions based on

pre-tested result. The schedule was translated into Kannada and pre tested for the final use. The final format of the interview schedule is given in the Appendix - II.

The data was collected from drip irrigating farmers in an informal atmosphere by personal interview method.

3.9 STATISTICAL METHODS USED TO ANALYSE THE DATA

The statistical tools such as frequency, percentage, besides mean and standard deviation were used to draw the varied inference.

3.10 DEFINITIONS OF TERMS & CONCEPTS

Depreciation: Depreciation of pumps sets and drip irrigation components such as main pipes, sub main pipes etc., was calculated using straight-line method. The average life of pump set was assumed to be 20 years and the junk value was taken as 20 per cent of the initial cost. The average life of main pipes, sub main pipes, filters and valves was assumed to be 15 years and the junk value was taken as 20 per cent of the initial cost. The average life of laterals and drippers/micro tubes was assumed to be 10 years with out any junk value (Ananda, 1992).

$$\text{Depreciation} = \frac{\text{Initial cost} - \text{Junk value}}{\text{Average life of component in years}}$$

Electricity Charges: Electricity charges for the use of pump set were calculated at Karnataka Power Transmission Corporation limited rates viz., Rs.500 per HP motor per year.

Costs on human labour: Use of human labour was estimated in terms of man-days of eight hours. Women labour days converted average wage rate per man-days was used as the cost of human labour.

Returns: Returns from arecanut and banana crops were recorded in physical quantities and the monetary value of produce was calculated considering the prices received by the cultivator.

Results

IV. RESULTS

The results are presented under the following major heads in accordance with the objectives of the study.

4.1 Personal, socio-economic and psychological characteristics of drip irrigation farmers.

4.2 Knowledge level about drip irrigation management practices.

4.3 Adoption level of drip irrigation management practices.

4.4 The extent of benefits derived from drip irrigation system.

4.5 Constraints faced by the drip irrigation farmers.

4.1 PERSONAL, SOCIO-ECONOMIC AND PSYCHOLOGICAL CHARACTERISTICS OF DRIP IRRIGATION FARMERS.

The data on the distribution of drip irrigation farmers according to their personal, socio-economic and psychological characteristics as depicted in Table 4 have been presented here under.

4.1.1 Age

It was found that comparatively more number of respondents (40%) belonged to the middle age group followed by young age (32.22%) and old age group (27.78%) category distribution.

4.1.2 Education

It was clear from the data that all the respondents were educated, of which 31.11 per cent studied up to high school, 30.00 per cent had the graduation and 24.44 per cent educated up to pre-university. Where as,

middle and primary school education was possessed by 8.89 per cent and 5.56 per cent of the respondents respectively.

4.1.3 Landholding

The distribution of respondents according to landholding revealed that comparatively more number of farmers (46.67%) belonged to "semi medium" category followed by "medium" (32.22%) and "small land holding" categories (18.89%). Where as in "big farmers" category only 2.22 per cent of farmers were noticed.

4.1.4 Area under drip irrigation

It was evident that a high percent of drip irrigation farmers (64.45%) were noticed in "medium irrigated land" category. Where as in "high" (> 8.01 acres and above) and low (less than 2.50 acres) drip irrigated category only 11.11 per cent and 24.44 per cent of farmers were respectively found.

4.1.5 Annual income

It was evident that 42.22 per cent of the respondents belonged to "medium level of income" (Rs.1 – 2 lakhs) and in "low income" category 30.00 per cent of respondents were noticed. Where as 27.78 per cent of farmers belonged to "high income" group.

4.1.6 Innovative proneness

The distribution of "high innovative proneness" was noticed by 52.22 per cent of farmers followed by 31.11 per cent of them having

Table 4: Personal, Socio-Economic and Psychological characteristics of drip irrigation farmers

(n=90)

Sl. No.	Characteristics	Number	Per cent
1.	Age		
	Young age (up to 40)	29	32.22
	Middle age (41-50)	36	40.00
	Old age (51 & above)	25	27.78
2.	Education		
	Primary	5	5.56
	Middle school	8	8.89
	High school	28	31.11
	Pre-University	22	24.44
	Graduate	27	30.00
3.	Land holding		
	Small farmers	17	18.89
	Semi-medium farmers	42	46.67
	Medium farmers	29	32.22
	Big farmers	2	2.22
4.	Area under drip irrigation		
	High (> 8.00 acre)	10	11.11
	Medium (2.50-8.00 acre)	58	64.45
	Low (< 2.50 acre)	22	24.44
5.	Annual income		
	High (Rs. 2,00,001 & above)	25	27.78
	Medium (Rs.1, 00,000- Rs. 2,00,000)	38	42.22
	Low (Rs. < 1,00,000)	27	30.00

Contd....

6.	Innovative proneness		
	High	47	52.22
	Medium	28	31.11
	Low	15	16.67
7.	Scientific orientation		
	High	31	34.44
	Medium	41	45.56
	Low	18	20.00
8.	Risk orientation		
	High	32	35.55
	Medium	25	27.78
	Low	33	36.67
9.	Social Participation		
	High	29	32.22
	Medium	38	42.22
	Low	23	25.56
10.	Mass media participation		
	High	32	35.56
	Medium	37	41.11
	Low	21	23.33

"medium innovative proneness". The remaining 16.67 per cent of the farmers were found to exhibit "low innovative proneness".

4.1.7 Scientific orientation

The incidence of "high scientific orientation" was observed among 34.44 percent of farmers, however a higher proportion of the farmers 45.56 per cent found to be possessed "medium scientific orientation" and the remaining 20.00 per cent had "low scientific orientation".

4.1.8 Risk orientation

It was clear that an equal percentage of respondents had "low" (36.67%) and "high" (35.55%) risk orientation and the remaining 27.78 per cent possessed "medium risk orientation".

4.1.9 Social participation

It was clear from Table 4 that 42.22 per cent of the respondents belonged to "medium level of social participation" and in "low level of social participation" category 25.56 per cent of respondents were noticed. Where as 32.22 per cent of farmers belonged to "high level of social participation".

It was evident from the table 5 that more percent of respondents were member (60%) and office bearers (27.77%) of agricultural co-operative society. Among them 72.15 per cent found to be participated regularly and 27.84 per cent had participated occasionally.

Table 5: Social participation of drip irrigation farmers

(n=90)

Sl. No.	Name of organisation	Nature of participation				Extent of Participation	
		Member		Office bearers			
		Number	Per cent	Number	Per cent	Regularly	Occasionally
1	Gram panchayat	2	2.22	2	2.22	4 (100.00)	-
2	Taluk panchayat	1	1.11	1	1.11	1 (50.00)	1 (50.00)
3	Zilla panchayat	1	1.11	-	-	1 (100.00)	-
4	Agril. Co-operative societies	54	60.00	25	27.77	57 (72.15)	22 (27.84)

Figures in paranthesis indicates the percentage

Regarding participation in Gram panchayat only 2.22 per cent each possessed membership and were office bearers with cent per cent regular participation.

Similarly a negligible percent of respondents were member (1.11%) and officer bearers (1.11%) of taluk panchayat with equal participation as regularly and occasionally. Lastly only one respondent possessed the membership in Zilla panchayat with a regular participation.

4.1.10 Mass media participation

It was found (Table 4) that 41.11 per cent of the respondents belonged to medium level of mass media participation, followed by low level (35.56%) of mass media participation where as 23.33% of respondents were noticed in high mass media participation.

The results of Table 6 highlight that 47.78 per cent of respondents were regular readers of Newspaper, 37.78 per cent were found read occasionally and 14.44 per cent were not in habit of reading Newspaper. On the contrary regular reading of Krushi patrike was found to the extent of only 14.44 per cent, occasional reading by 13.38 per cent but a high percent (72.22%) never read the magazine.

In case of listening of agriculture programmes only 10.00 per cent were regular listeners but a majority (84.44%) belonged to never listening category. However in viewing of agriculture programmes telecasted from television 34.44 per cent were found to regular view the programmes as against 56.66 per cent of occasional viewing and 8.88 per cent in the never viewing category.

Table 6 : Mass media participation of drip irrigation farmers

(n=90)

Sl. No.	Name of mass media	Utilization of mass media					
		Regularly		Occasionally		Never	
		Number	Per cent	Number	Per cent	Number	Per cent
1	News paper	43	47.78	34	37.78	13	14.44
2	Krushi patrike	13	14.44	12	13.38	65	72.22
3	Radio	9	10.00	5	5.55	96	84.44
4	Television	31	34.44	51	56.66	8	8.88

4.2 KNOWLEDGE OF DRIP IRRIGATION MANAGEMENT PRACTICES BY THE DRIP IRRIGATION FARMERS

4.2.1 Distribution of drip irrigation farmers according to their overall knowledge of management practices

The data in table 7 reveals that, the "high knowledge" of management practices was noticed with 28.89 per cent of respondents, where as "medium knowledge" was exhibited by 38.89 per cent of respondents, followed by "low knowledge" with 32.22 per cent of drip irrigation farmers.

4.2.2 Knowledge level of drip irrigation farmers regarding individual recommended management practices of drip irrigation

The data regarding knowledge of individual recommended management practices in drip irrigation is presented in table 8.

Main purpose of drip irrigation

A high per cent of respondents possessed the knowledge of saving irrigation water (95.55%) and providing same quantity of water for all crops (91.11%). Where as the knowledge of increasing area under irrigation and as an easy method of irrigation was known to 58.88 and 50.00 per cent of respondents. On the contrary the complete information of the purpose was noticed by 48.88 per cent of respondents.

Suitable area for drip irrigation

It was found that only 26.66 per cent of respondents had the complete knowledge of suitable area for the laying out the system. Further, it was observed that majority of respondents possessed the

Table 7: Distribution of drip irrigation farmers according to their over all knowledge of management practices

(n=90)

Knowledge category	Drip irrigation farmers	
	Number	Per cent
High (43 & above)	26	28.89
Medium (34 – 42)	35	38.89
Low (Up to 33)	29	32.22

Mean = 37.74

S.D = 8.64

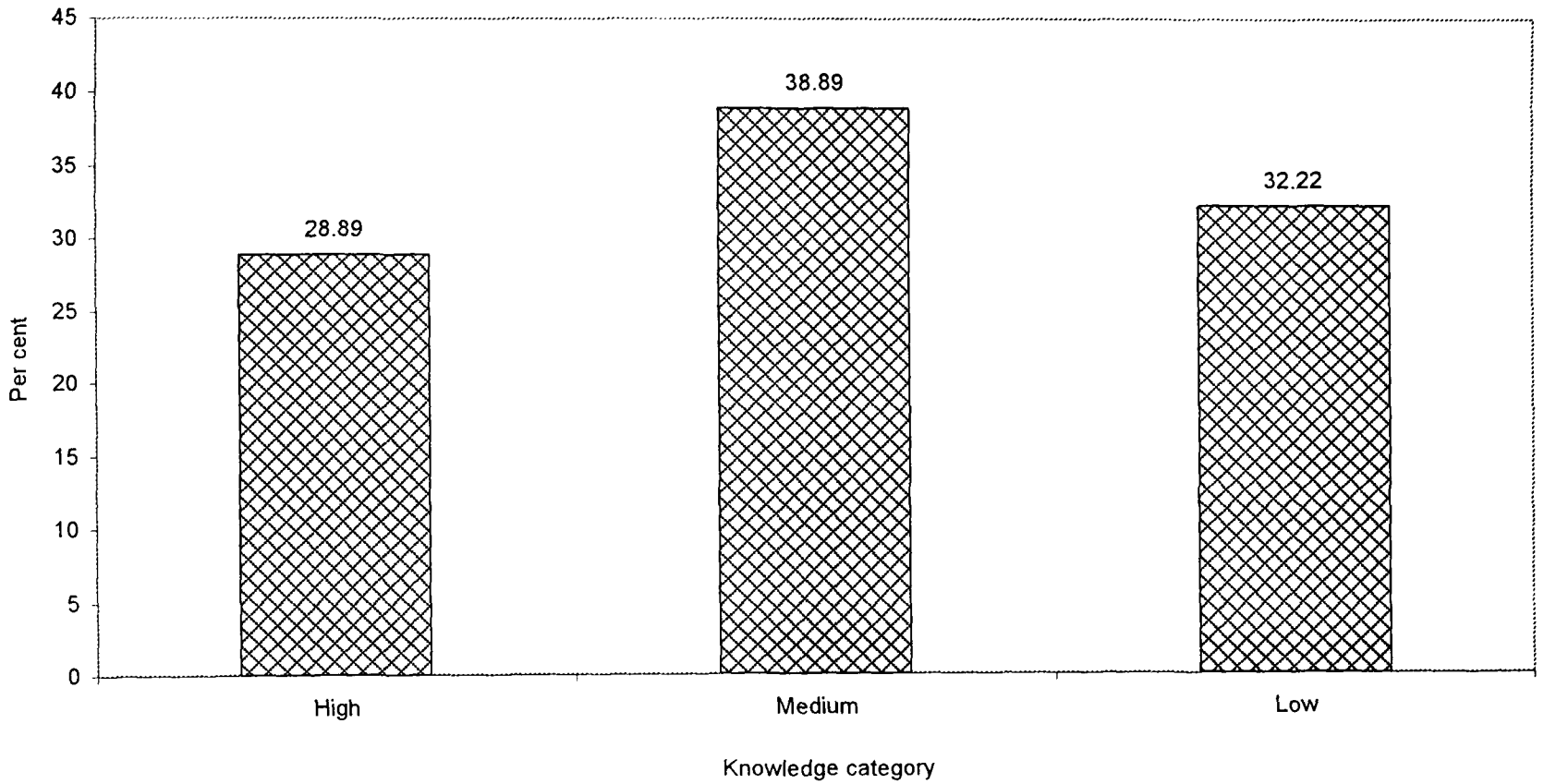


Fig. 4: Distribution of drip irrigation farmers according to their overall knowledge of management practices

knowledge of suitability of drip system for area with less water available (88.88%), followed by suitability to area with maximum water available (41.11%) and salt affected area (30%).

Suitable crops for drip irrigation

In case of suitability of recommended crops for drip irrigation, all the respondents expressed the suitability for horticulture crops, followed by half the respondents pointed out the suitability for commercial crops and less than one tenth expressed the suitability to leguminous crops. However the complete knowledge of suitability to recommended crops was not found with any of the respondents.

Suitable soil for drip irrigation

It was observed that a high percent of respondents possessed the complete knowledge of recommended soils for drip irrigation (94.44%). Similarly majority had knowledge of suitability of the system to red soil (97.78%), sandy soils (96.66%) and black soils (94.44%)

Measures to be taken before installing the system

A high percent of respondents (97.77%) expressed the knowledge of conducting water test, followed by knowledge of deciding of crops (80%) and conducting soil test (77.77%). However, the full knowledge of the measures to be taken before installing the system was noticed with 77.77 per cent of the respondents.

Important factors to be considered while installing drip system

The complete knowledge of factors to be considered during installing of system was noticed among 42.22 per cent of respondents. Further it

Table 8: Knowledge of drip irrigation management practices by the drip irrigation farmers

(n=90)

Sl. No.	Item/Management practices	Drip irrigating farmers expressing the knowledge	
		Number	Percent
1.	Main purpose of practicing drip irrigation		
a.	To provide same quantity of water for all crops	82	91.11
b.	To save water	86	95.55
c.	To increase area under irrigation	53	58.88
d.	As an easy method of irrigation	45	50.00
e.	All the above	44	48.88
2.	Land suitable for drip irrigation		
a.	Area with low water availability	80	88.88
b.	Area with maximum water availability	37	41.11
c.	Salt water area	27	30.00
d.	Suited to all the above situations	24	26.66
3.	Suitable crops for drip irrigation		
a.	Horticultural crops	90	100.00
b.	Commercial crops	47	52.22
c.	Leguminous crops	3	3.33
d.	All the above	Nil	0.00
4.	Suitable soil for drip irrigation		
a.	Black soil	85	94.44
b.	Sandy soil	87	96.66
c.	Red soil	88	97.78
d.	Suited to all the above soils	85	94.44

Contd....

5.	Measures to be taken before installing the system		
a.	Conducting water test	88	97.77
b.	Conducting soil test	70	77.77
c.	Deciding of crops	72	80.00
d.	All the above are essential	70	77.77
6.	Important factors to be considered during /while installing drip system		
a.	Availability of water	69	76.66
b.	Slope of the land	38	42.22
c.	Spacing between the crops	65	72.22
d.	Amount of water required for crop	62	68.88
e.	All these factors are essential	38	42.22
7.	Necessity of water tank for pumping water through drippers		
a.	Water tank is a must	28	31.11
b.	Water tank may not be necessary	90	100.00
c.	Both (a) and (b)	22	24.44
8.	Essential parts of drip system		
a.	Air releasing valve	31	34.44
b.	Valve	90	100.00
c.	Non-returning valve	46	51.11
d.	End cap	90	100.00
e.	Laterals	90	100.00
f.	Connectors	62	68.88
g.	Filters	90	100.00
h.	Fertigation tank	2	2.22
i.	Pressure regulating valve	9	10.00
j.	Pressure gauge	40	44.44
k.	All the above parts are essential	2	2.22

Contd....

9.	Types of drippers		
a.	Non-removable	36	40.00
b.	Pressure regulator drip	3	3.33
c.	Removable drip	73	81.11
d.	Small pipe drip	90	100.00
e.	Jet pipe drip	6	6.66
f.	Circulating small sprinkler	79	87.77
g.	Circulating sprinkler	30	33.33
h.	Bubbler	1	1.11
i.	All the above	1	1.11
10.	Frequently cleaning components/parts of the system		
a.	Pump	34	37.77
b.	Filters	90	100.00
c.	Pipes	81	90.00
d.	Laterals	77	85.55
e.	Drippers	52	57.77
f.	All the above	34	37.77
11.	The purpose of using chlorine		
a.	To maintain pH of water	20	22.22
b.	To keep system in clean condition	9	10.00
c.	Both (a) and (b)	8	8.88
12.	Type of fertilizers for fertigation		
a.	Liquid form of fertilizers	24	26.66
b.	Water soluble form of fertilizers	19	21.11
c.	Both (a) and (b)	15	16.67
13.	Saving of water by drip irrigation as compared to surface method		
a.	40-60 per cent	28	31.12
b.	61-80 per cent	62	68.88

Contd....

14.	The desired interval of opening end cap		
a.	Every day	18	20.00
b.	Once in a week*	33	36.66
c.	Once in two weeks	23	25.55
d.	Once in a month	16	17.77
15.	The ideal interval of opening ends of laterals		
a.	Once in a week	9	10.00
b.	Once in two weeks	35	38.88
c.	Once in a month*	46	51.11
16.	The recommended interval of opening screen filters		
a.	Every day	49	54.44
b.	Once in two days*	33	36.66
c.	Once in a week	8	8.88
17.	Suitable interval of checking the desirable quantum of water release.		
a.	Once in two weeks	27	30.00
b.	Once in a month*	63	70.00
18.	The ideal interval of cleaning drippers		
a.	Once in a month*	Nil	0.00
b.	Once in two months	11	12.22
c.	Once in six months	79	64.44

* Recommended practice

was also observed that a high percentage of farmers expressed the knowledge of only availability of water (76.66%), followed by spacing between crops (72.22%) and amount of water required for crop (68.88%) as important factors. Lastly the knowledge of slope of the land required was observed with 42.22 per cent of farmers.

Necessity of water tank for pumping water through drippers

It was found that only 24.44 per cent of respondents had the complete knowledge of both essentiality and non-essentiality of water tank for pumping water through drippers. Where as all the respondents expressed the non-essentiality of water tank and one third of farmers (31.11%) expressed that water tank is must for pumping water through drippers.

Essential parts of the drip system

The knowledge of all the essential parts of drip system was expressed by only 2.22 per cent of farmers, where as in partial knowledge category it was observed that cent percent had knowledge of valve, end cap, laterals and filter parts. Similarly the knowledge about connectors, non-returning valve, pressure guage and air releasing valve was noticed by 68.88 per cent, 51.11 per cent, 44.44 per cent and 34.44 per cent of farmers respectively. Lastly the essentiality of Fertigation tank was expressed by 2.22 per cent of farmers only.

Types of drippers

The knowledge of different types of drippers was noticed with only one respondent. However, the majority of respondents had the knowledge

of small pipe drip (100%), followed by circulating small sprinkler (87.77%) and removable drip (81.11%)types of drippers. The knowledge of only non-removable and circulating sprinkler type drippers was noticed among 40.00 per cent and 33.33 per cent of farmers respectively. And negligible percent of respondents possessed the knowledge of jet type drip (6.66%), pressure regulator (3.33%) and bubbler (1.11%) types of drippers.

Cleaning components/parts of drip system

The required knowledge of cleaning all the parts of system was noticed with only 37.77 per cent of respondents, where as cent percent possessed the knowledge of cleaning of filters only. Further it was noticed that a high per cent of farmers expressed cleaning of only pipes (90%) and laterals (85.55%). And lastly the knowledge about cleaning of drippers and pumps was possessed by 57.77 and 37.77 per cent of respondents respectively.

Purpose of using chlorine

It was evident that less than one tenth of respondents (8.88%) possessed the desired knowledge of using chlorine, similarly a less per cent of farmers pointed out the use of chlorine for maintaining PH of water (22.22%) and to keep the system in clean condition (10%).

Types of fertilizer used for fertigation

It was noticed that only 16.67 per cent of respondents possessed complete knowledge about recommended types of fertilizer for fertigation. Further the partial knowledge of using only liquid form and water soluble

form of fertilizer was observed with 26.66 and 21.11 per cent of respondents respectively.

Saving of water by drip irrigation

The majority of respondents (68.88%) possessed the knowledge of saving water to the extent of 61-80 per cent. Where as 31.12 per cent of respondents opined that the drip irrigation could save water up to 40-60 per cent.

Desired interval of opening end cap

The knowledge of opening end cap of system during once in a week was expressed by comparatively more number of respondents (36.66%). Where as 25.55 and 17.77 per cent of respondents expressed the interval of once in two weeks and once in a month respectively. However the knowledge of opening end cap of drip every day was pointed out by 20.00 per cent of respondents.

Ideal interval of opening laterals end

It was observed that 51.11 per cent of respondents possessed the desired knowledge of opening laterals once in a month, similarly the ideal interval of once in two weeks and once in a week was expressed by 38.88 and 10.00 per cent of respondents respectively.

Interval of opening screen filters

Half of the respondents (54.44%) possessed the recommended knowledge of opening screen filters daily. Where as interval of once in two

days and once a week was known to 36.66 and 8.88 per cent of farmers respectively.

Interval of checking the desirable quantum of water release

It was found that nearly three fourth of respondents (70%) had expressed checking the system at higher interval of once in a month. Where as the interval of once in two weeks was known to 30.00 per cent respondents.

Interval of cleaning drippers

A high percent of respondents (64.44%) possessed the knowledge of cleaning drippers/emitters at longer interval of once in six months, where as 12.22 per cent of farmers had pointed out the cleaning once in two months. Where as, none of the respondents had recommended of interval of cleaning drippers

4.3 EXTENT OF ADOPTION OF DRIP IRRIGATION MANAGEMENT PRACTICES BY DRIP IRRIGATION FARMERS

4.3.1 Distribution of drip irrigation farmers according to their extent of adoption of drip irrigation management practices

The distribution of data in Table 9 reveals that half the respondents (55.55%) were noticed in medium adoption category. Where as around one fourth each was observed in high (21.11%) and low (23.33%) adoption categories.

Table 9: Distribution of drip irrigation farmers according to their extent of adoption of management practices

(n=90)

Adoption category	Drip irrigation farmers	
	Number	Per cent
High (25 & above)	19	21.11
Medium (20 - 24)	50	55.55
Low (Up to 19)	21	23.33

Mean = 23.04

S.D = 4.52

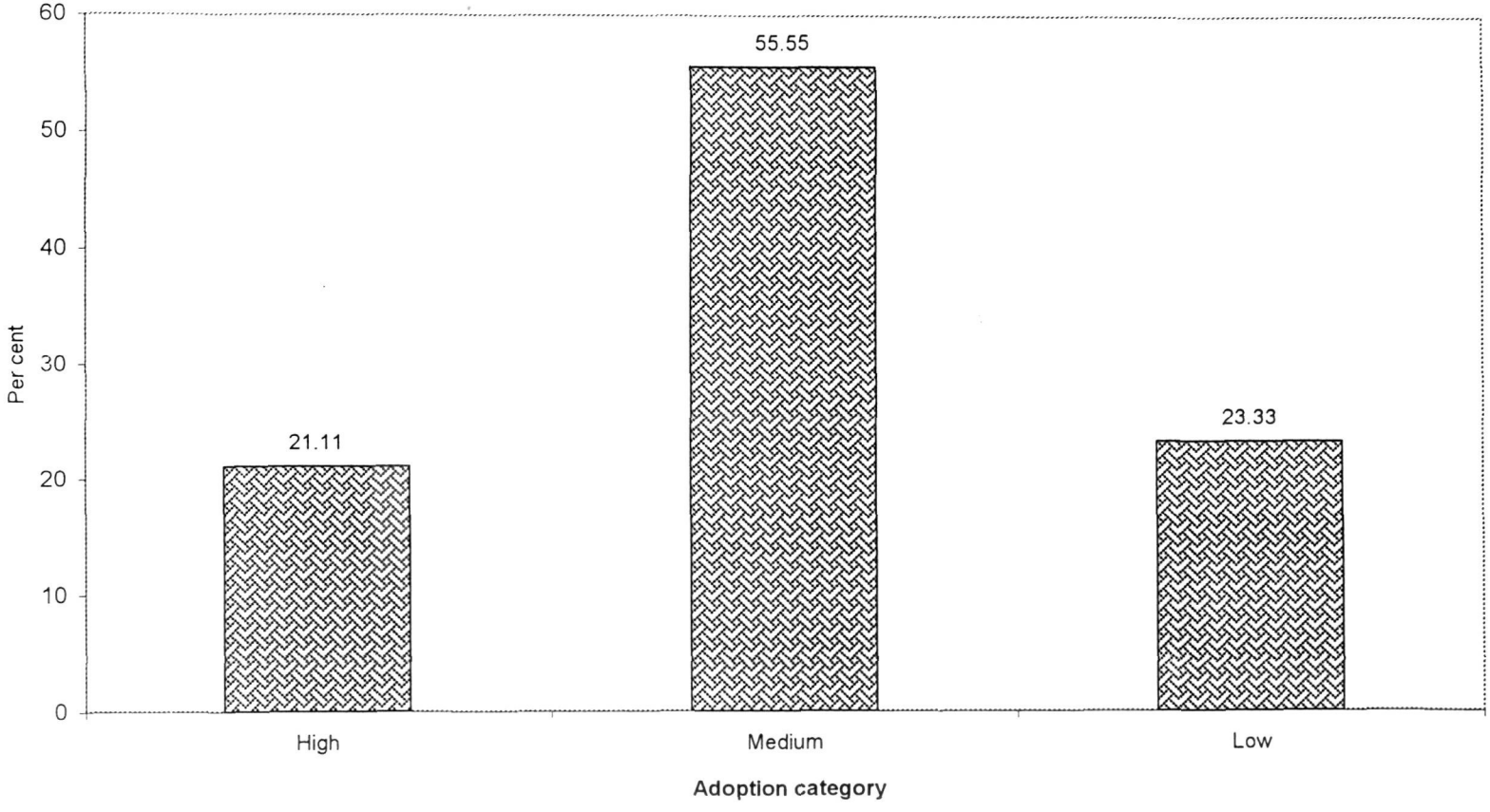


Fig. 5: Distribution of drip irrigation farm of according to the extent of adoption of management practices

4.3.2 Extent of adoption of individual management practices by the drip irrigation farmers

The data regarding adoption of individual management practices in drip irrigation is presented is Table 10.

4.3.2.1Practices to be adopted before installation of drip irrigation

All the recommended measures before installing the system was adopted by only 21.11 per cent of respondents. Further the adoption of individual practice shows that a high per cent of respondents had adopted the practices like conducting water test (80%) and soil test (77.77%). The practice of preparing cropping pattern and measuring the quantum of water available were found to the adopted by 75.55 per cent of respondents each, where as land mapping was followed by 21.11 per cent of respondents only.

4.3.2.2 Practices to be adopted while installing the system

Essential parts of the drip system

It was noticed that cent per cent of respondents had adopted the part like end cap, mesh filters (93.33%) and non-returning valve (54.44%). Where as, 24.44 per cent and 20.00 per cent of respondents adopted pressure guage and air releasing valve. None of the farmers adopted all the essential parts.

Types of drippers installed

Of the different types of drippers to be installed majority of the respondents (96.66%) were found to have installed the small pipe drips

Table 10: Extent of adoption of management practices by drip irrigation farmers

(n=90)

Sl. no.	Management practices	Drip irrigating farmers adopting the practice	
		Number	Per cent
I.	**Before installation of the system**		
1.	Conducting water test	72	80.00
2.	Conducting soil test	70	77.77
3.	Preparing cropping pattern	68	75.55
4.	Land mapping	19	21.11
5.	Measuring the quantum of water available	68	75.55
6.	All the above	19	21.11
II.	**While installing the system**		
1.	Essential parts of drip system		
a.	End cap	90	100.00
b.	Mesh filters	84	93.33
c.	Non-returning valve	49	54.44
d.	Pressure guage	22	24.44
e.	Air releasing valve	18	20.00
f.	All the above*	Nil	0.00
2.	Type of drippers installed		
a.	Small pipe drip system (1.5 mm)	87	96.66
b.	Opening type	1	1.11
c.	Non-circulating sprinkler	1	1.11
d.	Jet drip system	1	1.11

Contd...

III. After installation of drip irrigation			
1.	Frequently cleaning components of the system		
a.	Pumps	34	37.77
b.	Filters	84	93.33
c.	Pipes	85	94.44
d.	Laterals	45	50.00
e.	Drippers	23	25.55
f.	All the above components*	23	25.55
2.	Interval of opening end cap		
a.	Once in a week	3	3.33
b.	Once in two weeks	15	16.66
c.	Once in a month*	27	30.00
3.	Interval of cleaning screen filters		
a.	Every day	25	27.77
b.	Once in two days*	45	50.00
c.	Once in a week	14	15.55
d.	Once in a month	11	12.22
e.	Not opened end cap	5	5.55
4.	Chemicals used for cleaning of system (Bleaching powder /calcium hypo chloride/sodium hypo chloride/ chlorine gas/ copper sulphate/ hydrochloric acid)	4	4.44
5	Interval of checking of desired quantity of water discharge		
a.	Once in a month*	6	6.66
b.	Once in three months	2	2.22
c.	Once in six months	8	8.88

Contd....

6.	Interval of cleaning drippers/ emitters		
a.	Once in a week	8	8.88
b.	Once in two weeks	12	13.33
c.	Once in a month*	3	3.33
7.	Stipulated time for irrigation/plant	Nil	0.00
8.	Practicing of fertigation	Nil	0.00
10.	Repairing components of system		
a.	Repairing of laterals	90	100.00
b.	Repairing of pipes	90	100.00
c.	Repairing of drippers	90	100.00

* Recommended practice

(1.5 mm). Where as only 1.11 per cent each had installed the opening type, non-circulating and jet type of drippers.

4.3.2.3 Practices to be adopted after installation of drip irrigation

Frequently cleaning components of the system

It was noticed that one-fourth of respondents were in the practice of cleaning all the components of system. Further it was clear that majority of respondents were cleaning pipes (94.44%) and filters (93.33%). Fifty per cent of the respondents followed cleaning of laterals, where as 37.77 and 25.55 per cent of respondents had cleaned pumps and drippers respectively.

Opening end caps

It was observed that half of the respondents adopted the recommended practice of opening end cap once in a week (51.11%). And less than one sixth were found to open the end cap at the interval of once in two weeks (16.66%), every day (14.44%) and once in a month (12.22%). Where as 5.55 per cent of farmers were found to have not opened the end cap so for.

Opening ends of laterals

The practice of opening laterals ends at desired interval of once in a month was observed with 30.00 per cent of respondents, followed by the intervals of once in two weeks and once in a week adoption by16.66 and 3.33 per cent of respondents respectively. Remaining per cent of respondents not yet all the opened the ends of laterals.

Cleaning screen filter

It was observed that half of the respondents were cleaning the screen filter at the recommended interval of once in two days. On the other hand the practice of cleaning screen filter daily was noticed among 27.77 per cent farmers and the interval of once in a week was in practice with 15.55 per cent of respondents.

Chemicals used for cleaning of system

The practice of cleaning system with the recommended chemicals was noticed with only 4.44 per cent of respondents.

Interval of checking the release of required quantity of water

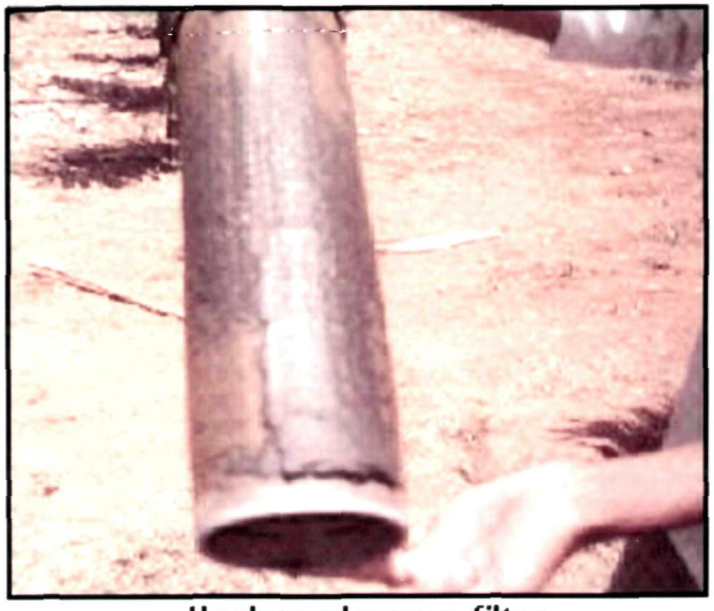
The results showed that less than one sixth of respondents (6.88%) were in the habit of checking the quantity of water release through the system at the desired interval of once in a month. Similarly the adoption of the practice at the interval of once in three months and six months was noticed among 2.22 and 8.88 per cent of farmers respectively.

Cleaning drippers/emitters

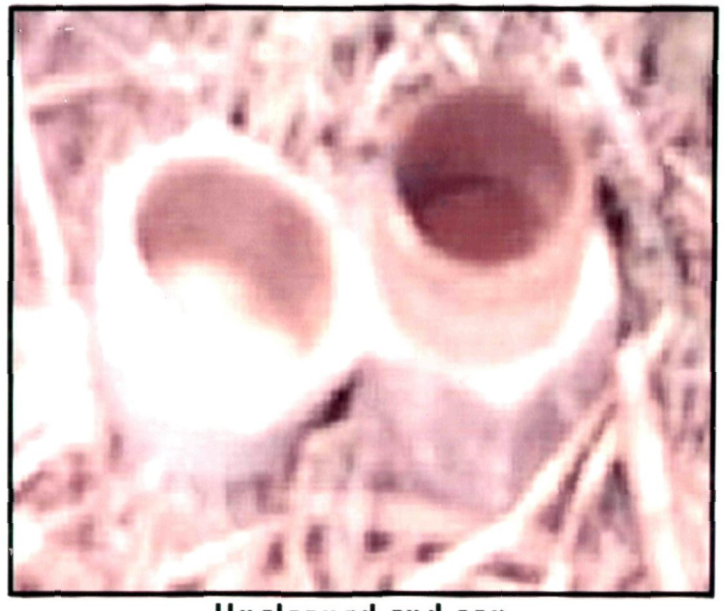
It was found that of the one fourth of respondents adopted the practice, only 8.88 per cent were cleaning drippers at recommended interval of once in a week. The other interval of once in two weeks and once in a month was followed by 13.33 and 3.33 per cent of respondents respectively.

Stipulated time for irrigation

It is observed that none of the farmer was following the stipulated time for release the required quantity of water for crops.

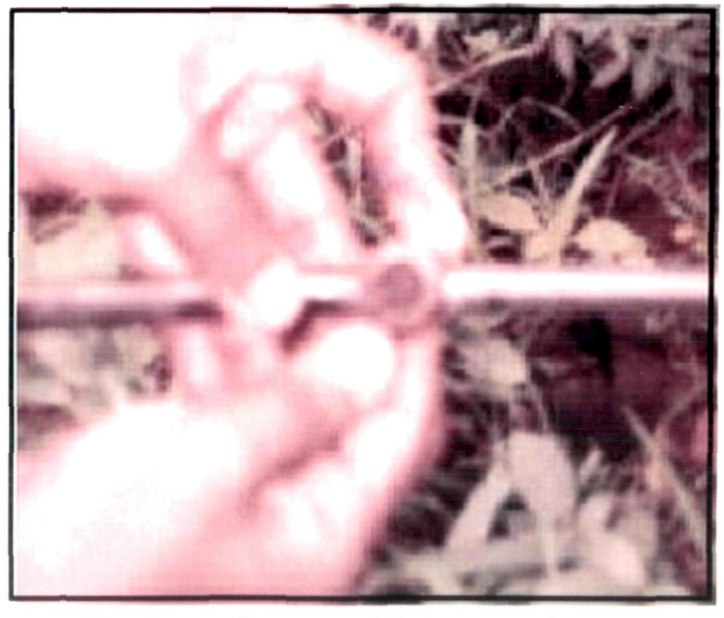


Uncleaned screen filter



Uncleaned end cap

Uncleaned end cap



Uncleaned removable type emitter

Plate 1: Defective management practices

Practicing fertigation

It was noticed that none of the respondents was practicing fertigation.

Repairing of the system

All the sample farmers were found to practice repairing of laterals, pipes and drippers.

4.4 BENEFITS DERIVED THROUGH DRIP IRRIGATION SYSTEM.

4.4.1 Advantages of drip irrigation as perceived by the drip irrigating farmers

The advantages of drip irrigation as presented in the Table 11 highlight that a high per cent of farmers had felt the advantages like saving of water (95.55%), Saving labour cost for irrigation (92.22%) and uniform application of water (91.11%). The benefits of improved quality of produce was expressed by 70.00 per cent of farmers. Half of the respondents point outed the advantage of easy method of irrigation application. Where as the benefits of decreased weed growth and increased crop yield were expressed by 40.00 and 24.44 per cent of farmers respectively.

4.4.2 Comparsion of yield and return in arecanut and banana inter cropping system under drip and surface method of irrigation

The results presented in table 12 indicate that the average yield in arecanut and banana under drip irrigation in comparison to surface irrigation method has shown an increase of 5.94 and 3.54 per cent

Table 11 : Advantages of drip irrigation

(n=90)

Sl. No.	Type of advantage	Drip irrigation farmers expressing the advantages	
		Number	Per cent
1.	Saving of labour cost for irrigation	83	92.22
2.	Saving of water	86	95.55
3.	Decreased weed growth	36	40.00
4.	Uniform application	82	91.11
5.	Improved quality of produce	63	70.00
6.	Increased crop yield	22	24.44
7.	Easy method of irrigation	45	50.00

Note : Multiple responses possible

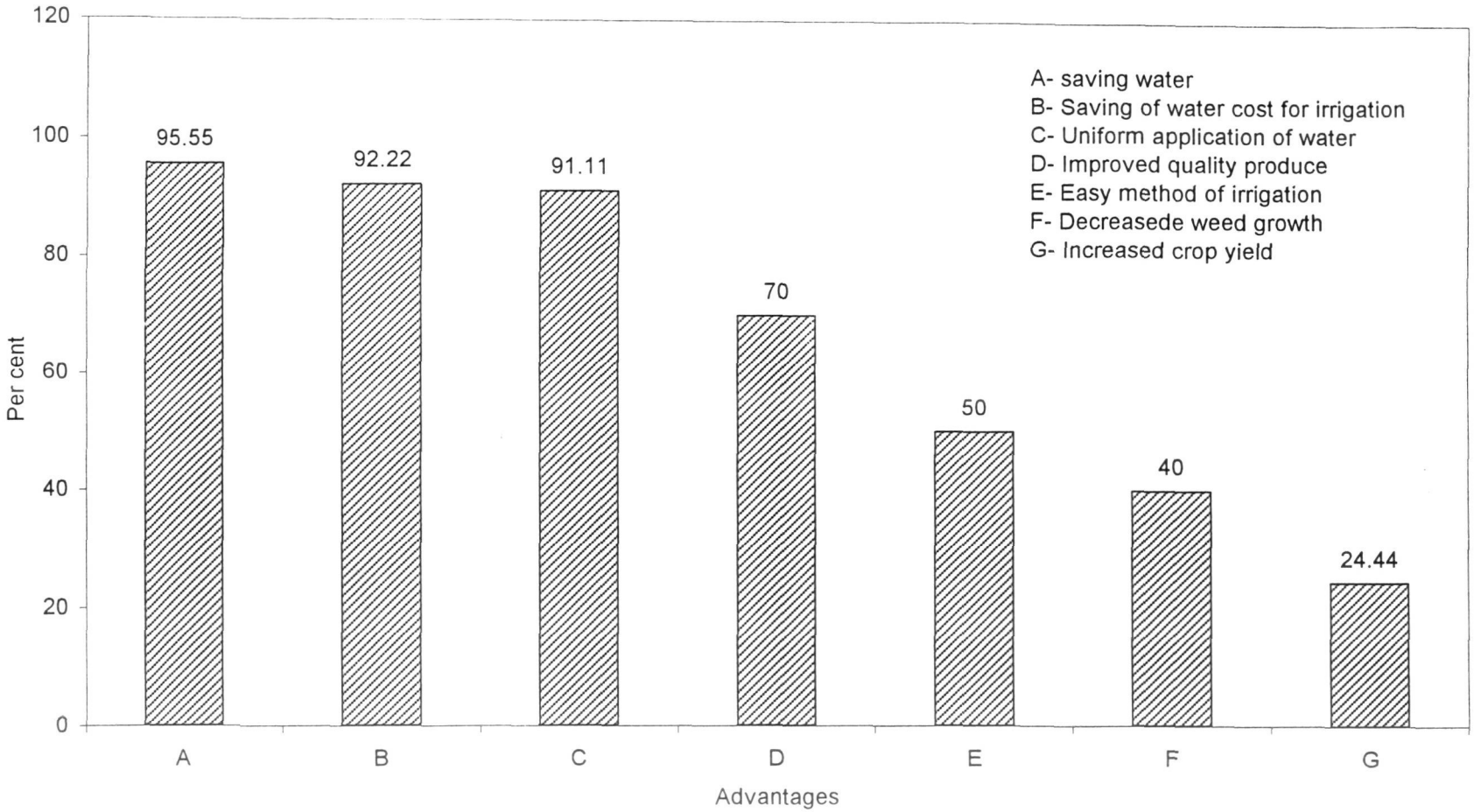


Fig. 6: Advantages of drip irrigation

respectively. Similarly total returns shown an increase to the extent of 5.92 and 3.54 per cent respectively. On the whole arecanut and banana intercropping system under drip irrigation had given an increased total gross return to the extent of 4.98 per cent.

It was also observed that the cost of production of arecanut and banana intercropping under drip system (Rs. 17609 per acre) has shown the decrease to the extent of 13.60 per cent in comparsion to surface irrigation method (Rs. 20005 per acre). And also the net return of drip irrigation (Rs. 41669 per acre) registered 12.83 per cent increase over surface method (Rs. 36321 per acre). Consequentely the B: C ratio was higher under drip system (1:3.36) as compared to surface method (1:2.81).

4.4.4 Comparsion of quality parameters of banana (Yelakki bale) crop under drip and surface method of irrigation

The data presented in table 13 reveals that all the enlisted quality parameters of banana crop grown under drip irrigation have shown an increasing trend. It was evident that the average length of fruit, average thickness of fruit, average number of hands/bunch and average number of fingers/bunch under drip system (4.73 inch, 2.53 inch, 12 and 103 respectively) were more as compared to surface irrigation method (4.52 inch, 2.32 inch, 10 and 92 respectively). Further it was observed that colour of fruit grown under drip irrigation was yellow, where as light green in case of surface method. Similarlly the benefits like controlled leaf spot and leaf yellowing with 5 days extended self-life were also noticed. The average number of days taken for harvesting was lesser in case of drip

Table 12 : Comparison of Yield and return in arecanut and banana inter cropping system under drip and surface method of irrigation

Particulars	Yield and return (per acre)				Per cent increase under drip	
	Drip irrigation (n=30)		Surface irrigation (n=30)			
	Arecanut	Banana	Arecanut	Banana	Arecanut	Banana
Average yield (qt/ac)	32.29	39.60	30.37	38.20	5.94	3.54
Total return (Rs.)	35,510.00	23,760.00	33,407.00	22,920.00	5.92	3.54
Gross return (Rs.)	59,279.00		56,327.00		4.98	
Cost of production (Rs.)	17,609.00		20,005.00		- 13.60	
Net return (Rs.)	41,669.00		36,321.00		12.83	
B:C ratio	1:3.36		1:2.81		-	

Table 13: Comparative quality parameters of banana (Yelakki bale) crop under drip and surface method of irrigation

Sl. No.	Parameters	Drip irrigation (n=30)	Surface irrigation (n=30)
1.	Average number of hands/bunch	12	10
2.	Average number of fingers/bunch	103	92
3.	Average length of fruit (inch)	4.73	4.52
4.	Average thickness of fruit (Inch)	2.53	2.32
5.	Colour of fruit	Yellow	Light green
6.	Cracking of fruit (No. per bunch)	Absent	4%
7.	Incident of leaf spots & yellowing of leaf	Controlled	3%
8.	Average number of days taken for harvesting	398	435
9.	Shelf life of fruit (number of days)	15	10

irrigation (398 days) as compared to surface method of irrigation (435 days).

4.5 CONSTRAINTS IN ADOPTION OF DRIP IRRIGATION MANAGEMENT PRACTICES

The constraints experienced by the respondents in the adoption of drip irrigation as presented in table 14 indicates that a high per cent of farmers had expressed the problem of non-availability of quality material (95.55%) and no follow up services by drip agencies (81.11%). The other constraints like high initial investment cost, lack of capital to cover maximum holding under drip irrigation and delay in sanction of loan were experienced by 62.22, 56.66 and 53.33 per cent of farmers respectively. Lastly one third of respondents (36.66%) expressed the problem of leakage of system.

Table 14: Constraints in adoption of drip irrigation system

(n=90)

Sl. No.	Constraints	Number	Per cent
1.	Non-availability of quality spares of system	68	95.55
2.	No follow up service by drip agency	73	81.11
3.	High initial investment cost	56	62.22
4.	Lack of capital to cover maximum holding under drip irrigation	51	56.66
5.	Delay in sanction of loan	48	53.33
6.	Leakage of system	33	36.66

Note: Multiple responses possible

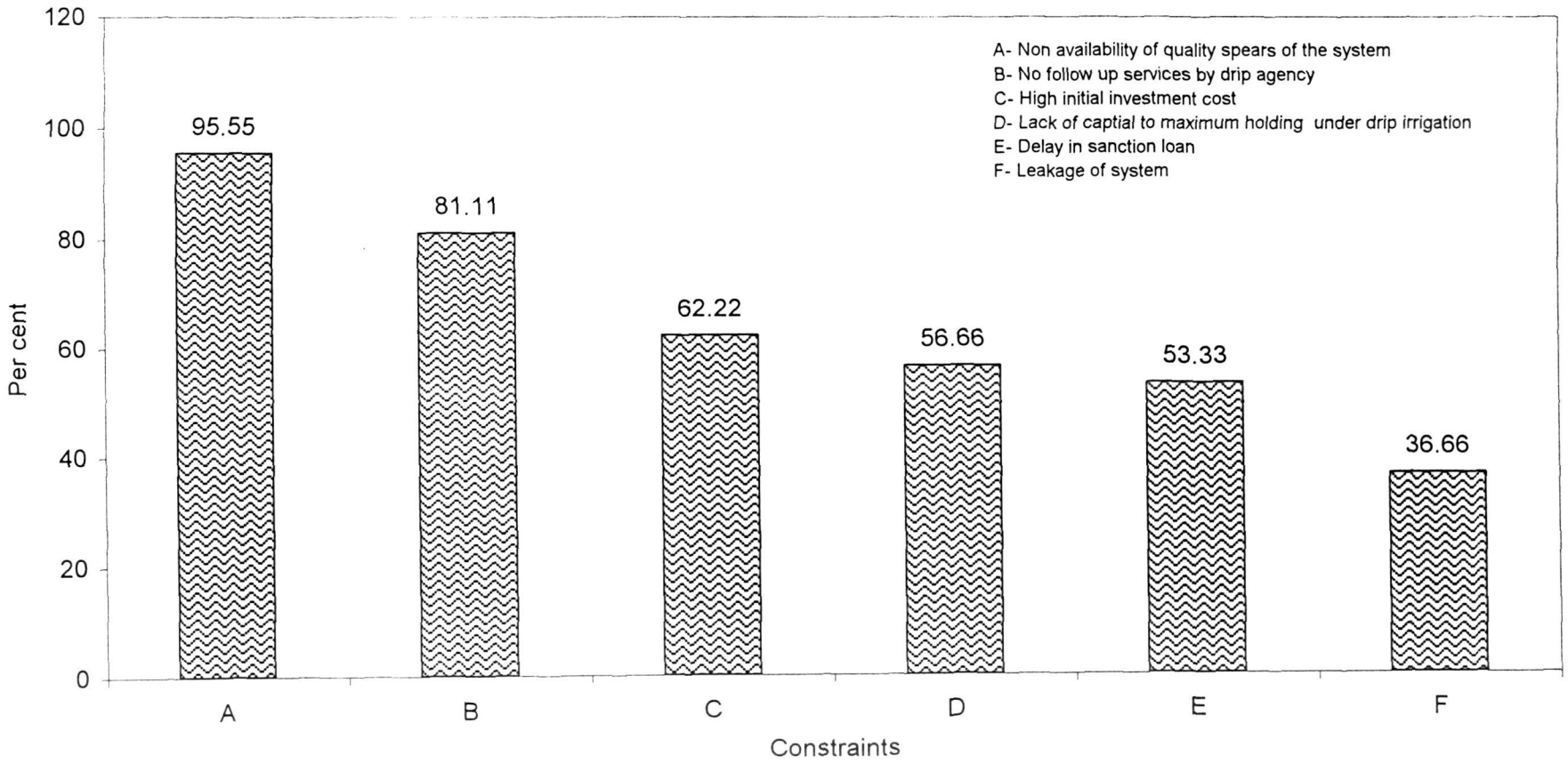


Fig. 7: Constraints in adoption of drip irrigation system

Leakage of pipe

Leakage of pipe

Leakage of submain

Plate 2: Leakage of system

Discussion

V. DISCUSSION

It has been convinced from the research findings that all the farmers do not possess complete knowledge and adopt the recommended practices to the fullest extent. In the present study the drip irrigation respondents with their divergent personal characteristics and varying degrees of techno-economic constraints which naturally favours gap in the knowledge and adoption of drip irrigation management practices. Therefore, the present study was an attempt to explore the socio-economic profile of the drip irrigation farmers with the focus on knowledge and adoption of management practices. The results of the study have been discussed and interpreted in the same order and sequence followed for the presentation of results.

5.1 PERSONAL, SOCIAL AND PSYCHOLOGICAL CHARACTERISTICS OF DRIP IRRIGATION FARMERS

The analysis of results presented in Table 6 revealed that middle age group was dominating (40%) category, followed by young age (32.22%) and old age (27.78%) groups.

Similarly the studies of Purnaik *et al.*(1992), Ravi Shankar (1995), Srinivasa Reddy (1995) and Veda Murthy (2002) who delineated the dominance of middle age among the sample farmers were in agreement with the present findings.

With regard to level of education, it is evident that around thirty per cent of farmers studied upto high school and graduation followed by pre-

university education by twenty five per cent respondents. And rest were educated upto middle and primary school.

This showed that the drip irrigation adopters were better educated as the effective management needs education for successful implementation of the drip system.

These results were in agreement with the findings of the studies reported by Phadtare *et al.* (1992), Puranik *et al.* (1992), Saravana Kumar (1996) and Babanna (2001).

In case of land holding majority of drip irrigation adopters (46.67%) belonged to semi-medium category (5-10 acres) and negligible per cent (2.22%) were big farmers.

The probable reason for this kind of situation may be that farmers with larger land holding will have more opportunities to adopt innovations. Where as farmers with smaller holdings try to irrigate the available area to a larger extent with a limited water resources.

The similar findings were also reported in the research studies of Kumbar (1983), Gotyal (1989), Lokhande (1990), Patalia (1991), Jagale (1992) and Srinivasa Reddy (1995).

As far as area under drip irrigation, a high per cent of farmers (64.45%) were noticed in medium irrigated category (2.5 – 8.00 acres).

Like wise the prevalence of medium irrigated land category was also reported in the studies of Ananda (1992) and Phadtare *et al.*(1992).

With respect to annual family income, about two fifth (42.22%) of respondents were observed in medium level of income and the remaining one-third group each were found to possess low and high income.

The studies of Kantharaju (1989) and Chandran (1997) revealed the similar situation where as research results reported by Babanna (2001) and Veda Murthy (2002) contradict to the present results.

With regard to innovative proneness half of the respondents possessed high innovative proneness and one sixth had exhibited low innovative proneness. It is evident that the drip irrigation necessitates the adoption of new technologies, hence the farmers will be in search of innovative ideas, which might have favoured the present situation.

The research studies of Ananada (1992), Balasubramani (1997), Kumar (1998) and Babanna (2001) who also reported the existence of medium innovative proneness were found to support the present findings.

The incidence of medium level of scientific orientation was possessed by less than fifty per cent of farmers (45.56%). However one third of farmers found to exhibit high scientific orientation. This shows that the scientific attitude of the respondents was satisfactory.

Like wise the existence of medium and high scientific orientation was also reported by Saravana Kumar (1996), Chandran (1997) and Veda Murthy (2002).

In case of risk orientation, about one-third proportion each of drip irrigation adopters were found to possess high (35.56%) and low (36.67%)

risk orientation, where as 27.78 per cent was noticed in medium risk orientation category.

It should be mentioned here that, the adoption of drip irrigation involves huge investment cost and further risks in efficient running of the system which might have favoured for the existence of risk bearing ability among two third of respondents.

Similarly in the studies of Ajay Kumar (1989) and Babanna (2001) the similar situation was reported, however contradictory observations were noticed from the research studies of Ramesh Babu (1987), Sumuthi (1987), Ananada (1992), Srinivasa Reddy (1995) and Saravana Kumar (1996).

Social Participation

The overall distribution shows that the medium level of social participation was noticed with 42.22 per cent of respondents and the remaining one-third group each were noticed in high and low social participation.

The studies of Srinivasa Reddy (1995), Balasubramani (1997) and Babanna (2001) revealed similar situation. Where as, research results reported by Kumar (1998) contradict the present findings.

The overview of social participation of drip irrigation adopters as presented in Table 5 revealed that the more participation of sample farmers as member and office bearers was noticed in Agricultural co-operative society (60 and 27.77% respectively), followed by participation in

Gram panchayat (2.22% each), Taluk panchayat (1.11%) and Zilla panchayat (1.11%).

This might be due to easy accessibility and necessity of agriculture co-operative society for availing crop loans, inputs, marketing arrangement and other consultancy benefits.

Mass media participation

The overall grouping of respondents reveals that medium level of mass media participation was observed with 41.11 per cent of respondents where as one-third (35.56%) belongs to high participation category followed by one fourth (23.33%) of respondents of low mass media participation category.

The similar findings were reported in the research study of Veda Murthy (2002), however research studies of Kumbar (1983) and Srinivasa Reddy (1995) found to contradict the present research results.

The scenario of mass media participation of drip irrigation adopters as depicted in Table 6 revealed that, in case of reading behavior of daily/monthly publications around fifty per cent of farmers were regular readers of Newspaper. Where as, Krushipatrike was regularly read by only one seventh of sample farmers. The costly publication and beyond reach farmers might have lead to this discouraging situation.

Similarly in case of listening of agriculture programmes broadcasted by Radio only one-tenth were regular listeners. Where as one third were found to regularly view the programmes telecasted from television.

5.2 KNOWLEDGE LEVEL OF DRIP IRRIGATION FARMERS REGARDING THE MANAGEMENT PRACTICES OF DRIP IRRIGATION

5.2.1 Distribution of drip irrigation farmers according to their overall knowledge of drip irrigation management practices

It is evident from the results (Table 7) that a high knowledge level about drip irrigation management practices was noticed by less than one-third of respondents (28.89%). Where as medium knowledge was possessed by 38.89 per cent of respondents, and low knowledge with one-third of sample farmers (32.22%) and indicated in Fig. 4.

This situation highlight that the knowledge of drip irrigation management practices was comparatively lesser than expected. Lack of follow up services by the drip agency and non implementation of educational programmes by the Department of Horticulture. Hence the need for strengthening the educational activities by the concerned agencies and development departments.

Like wise differential level of knowledge was also reported in the research study conducted by Ananda (1992).

5.2.2 Knowledge level of drip irrigation farmers regarding individual management practices of drip irrigation system

The findings regarding knowledge of individual management practices of drip irrigation (Table 8) has been discussed as under.

Main purpose of practicing drip irrigation

It was clear that nearly fifty per cent of farmers had complete knowledge about the purpose of practicing drip irrigation. This may be due to the better education and prevalence of high innovative proneness with the respondents.

Suitable area for drip irrigation

The complete knowledge of selecting suitable area for drip irrigation was noticed with twenty seven per cent of respondents only. However, majority (88.88%) expressed the suitability of area with less water available for laying out drip system.

It is the situation of water scarcity that compels the farmers to go for drip irrigation, which might be the reason for the incidence of above results.

Suitable crops for drip irrigation

The suitability of drip irrigation for all the recommended crop was known to none of the respondents, however cent per cent had expressed the suitability for horticultural crops, followed by other commercial and leguminous crops. This might be due to the fact that all the drip irrigation farmers in the study area were growing horticultural crops, hence the findings.

Suitable soil for drip irrigation

It can be seen that, all most all the respondents (97.78%) had complete knowledge about suitability of recommended soils for laying drip

system. The existence of all soil types in the study area might have favoured the present situation.

Measures to be taken before installing the system

The complete knowledge of taking up all the required measures like conducting water and soil tests and deciding of crops was known to two-third of respondents.

Thus it could be inferred that the respondents had more inclination towards taking up precautionary measures for successful installation of drip system, which is an encouraging situation.

Important factors to be considered while installing drip system

It is clear from the data that, more than forty per cent of respondents (42.22%) possessed the complete knowledge of considering the factors like slope of land, availability of water, spacing between crops and water requirement of crop. And a high per cent of farmers expressed the knowledge of considering the availability of water (76.66%) only, followed by spacing between crops (72.22%) and amount of water required for crop (68.88%).

Necessity of water tank for pumping water through drippers

It was observed that only one fourth of sample possessed the required knowledge regarding essentiality of water tank for pumping water through drippers. Where as cent per cent of farmers felt that water tank was not essential and one third among them expressed the requirement of water tank in drip irrigation.

Essential parts of drip system

The knowledge of all the required essential parts of drip system was noticed with only 2.22 per cent of respondents. On the contrary all the respondents were knowing valve, end cap, laterals and filter tank parts only, but the knowledge of fertigation tank was noticed with only 2.22 per cent of sample farmers.

The usual practice of fertilizer application and fertigation as optional requirement of the system might have favoured for this discouraging situation.

Possible types of drippers

All the possible types of drippers were known to only one respondent. However, the knowledge of small pipe drip was noticed by cent per cent of farmers, followed by around 80.00 per cent possessed the knowledge of circulating small sprinkler and removable type drippers. The easy availability of small pipe drip and its more use might have favoured the present results accordingly.

Cleaning the parts of drip system

It can be seen that only one third of the respondents possessed recommended knowledge of cleaning the essential parts of drip system. Where as cleaning of only filter was expressed by cent per cent of farmers, followed by knowledge of cleaning only pipes and laterals. This warrants for conducting demonstrations to emphasize for showing their importance.

Purpose of using chlorine

It has been observed that less than one tenth of respondents had the complete knowledge of using chlorine. The availability of pure water and absence of salt in water content in the study area might be the reason for lacking knowledge.

Types of fertilizer used for fertigation

The required knowledge of using either liquid form or water-soluble type fertilizers was noticed with only one sixth of farmers. This might be due to non-practicing of fertigation in the study area.

Water saving through drip system

Around two third of respondents possessed the knowledge of high saving of water to the extent of 61-80 per cent. Where as rest of farmers had the knowledge of 40-60 per cent saving of water. The different soil types, cropping pattern and variation in layout pattern of drip irrigation might be the reasons for varied knowledge possession with the respondents.

Interval of opening end cap

The ideal interval of opening end cap at daily was expressed by only one fifth of respondents. The knowledge of opening end cap during once in a week was noticed by one third of sample farmers.

This might be due to availability of pure and clean irrigation water in the study area.

Interval of opening laterals

It can be seen that all the respondents had the desired knowledge of opening the laterals at the intervals of once in a week, once in two weeks and once in a month.

Interval of opening of screen filters

It was observed that half of the respondents possessed the desired knowledge of opening screen filters daily.

Interval of checking the desirable quantum of water release through drippers

All the respondents expressed the ideal interval of either checking once in two weeks or once in two months.

Interval of cleaning drippers

It can be seen that a high per cent of respondents (64.44%) possessed the knowledge of cleaning of drippers at longer interval of once in six months. None of the respondents had complete knowledge of checking desirable quantum of water release through drip. The availability of pure and clean water for irrigation might have favoured the present situation.

5.3 EXTENT OF ADOPTION OF DRIP IRRIGATION MANAGEMENT PRACTICES BY DRIP IRRIGATION FARMERS

5.3.1 Distribution of drip irrigation farmers according to their extent of adoption of drip irrigation management practices

It could be seen from Table 9 and indicated in Fig. 5 that around fifty per cent of respondents (55.55%) were noticed in medium adoption and around one

fourth belonged to low (23.33%) adoption category. However a high adoption was observed with one fifth of sample farmers (21.11%) only. This clearly shows that there is much gap in adoption of recommended management practices in drip irrigation. These results highlights for planning of effective extension activities by the concerned departments and agencies.

Similarly the differential adoption of irrigation management practices was also reported from the studies of Shiva Murthy (1991), Raghavendra (1997), Kumar (1998), Babanna (2001) and Veda Murthy (2002).

5.3.2 Extent of adoption of individual management practices of drip irrigation by drip irrigation farmers

An over view of data (Table 10) regarding adoption of individual management practices in drip irrigation has been discussed here under.

5.3.2.1 Practices to be adopted before installing drip system

It was noticed that only one fifth of drip irrigation farmers (21.11%) were practicing all the recommended practices. However, a high per cent of farmers were practicing only conducting water test (80%) and soil test (77.77%), preparing cropping pattern and measuring the availability of water (75.55%). Lastly the practice of land mapping was followed by one fifth of respondents (21.11%) only.

5.3.2.2 Practices to be adopted while installing the system

Essential parts of the drip system

It was noticed that all the respondents adopted end cap, followed by use of mesh filters (93.33%). Around fifty per cent of farmers had the practice of using non-returning valve (54.44%). However pressure guage and air releasing valve parts were adopted by one fifth of respondents only.

This situation might be due to lacking awareness of their importance, extra cost involved and also thinking that these parts may not be essential.

Type of drippers installed

It was observed that majority of the respondents installed small pipe drip system (1.5 mm). This might be due to easy cleaning, maintaince and cost reducing.

5.3.2.3 Practices to be adopted after installing drip irrigation

Opening end caps

The practice of opening end caps of drip at the recommended interval of once in a week was observed with half the respondents (51.11%). Where as larger interval was noticed by less percentage of farmers (12.22%). This shows that the respondents might have realized the importance of the practice.

Opening ends of laterals

It was evident that around one third of farmers had the practice of opening ends of laterals at the desired interval of once in a month. Where as one fifth of respondents practiced it at a longer interval. But half of the farmers did not adopt the practice.

The usual tendency of farmers to solve the problem when it persists might have lead to the present situation.

Cleaning screen filters

Fifty per cent of respondents were practicing the cleaning of screen filters at the recommended interval of once in two days and the rest of them practiced at longer interval. However, none of them were noticed in not cleaning of screen filters. This might be due to the awareness that continuous water flow may lead to fungus growth on the screen filters that has resulted in proper distribution of water, there by increased pressure on water pumping has motors increased the electricity consumption. Hence the present situation.

Chemicals used for cleaning

A negligible percentage of respondents (4.44%) were found to use the chemicals for cleaning the drip irrigation system.

It was observed in the study area that the ground water found to be soft with less salt content and also the usual practice of pumping water directly through drippers. Might have resulted for not fetching the necessity of this practice thus the results accordingly.

Following stipulated time for irrigating unit area

It has been observed that none of the respondents had followed the stipulated time of irrigation to provide required amount for the crop. The frequent power fluctuation and decreasing water table might be the reasons for not adopting the recommended practice.

Practicing fertigation

It was noticed that none of the respondents had followed fertigation. The existing situation of non-application of fertilizer to horticulture crops might be the reason for the present situation.

Cleaning components of drip system

The recommended practice of cleaning all the components of drip system was noticed with one fourth of respondents. However, more than 90.00 per cent of farmers were found to clean pipes and filters followed by cleaning of laterals, pumps and drippers.

The lack of knowledge about the importance and procedure of cleaning important components of drip system might be the reason for the present study results. This calls for planning effective extension activities to educate the drip-irrigating farmers so as to sustain the system in the long run.

Repairing the parts of drip system

All the respondents had the practice of repairing the essential parts of drip system such as laterals, pipes and drippers, which is an encouraging situation.

5.4 BENEFITS DERIVED THROUGH DRIP IRRIGATION

5.4.1 Advantages of drip irrigation

It was evident that (Table 11) and Fig. 6 the majority of drip irrigation adopters had expressed the advantages like saving of water (95.55%), saving of labour cost for irrigation (92.22%) and uniform application of water (91.11%). The improved quality produce was expressed by 70.00 per cent of farmers, followed by half of the respondents with the benefited advantage of easy method of irrigation. The benefit of decreased weed growth was highlighted by twenty per cent of farmers.

These differential perception of advantages imply that drip irrigation farmers might have not planned with the objective of reaping excepted benefits. Hence, the need for witnessing these benefits by laying out demonstrations by the concerned department.

Similarly the results of increased yield, water saving, labour saving, quality produced and reduced weed growth have been reported by Kandaswamy (1990), Sivanappan (1991), Phadtare *et al* (1992), Pampattiwar *et al* (1993) and Shivakumar (2001), Muthuchamy *et al* (2001), Kannaiyan (2001) and Shivappan (2002). Lastly benefits of extended self-life of produce also get the support from the study of Patil *et al* (1993).

5.4.2 Comparative yields and returns in arecanut and banana inter cropping system under drip and surface method of irrigation

It was observed from the Table 12 that the drip-irrigated farmers had benefited the increased yields in arecanut and banana cropping to the

extent of 5.94 and 3.54 per cent respectively, similarly the increased returns to the extent of 5.92 and 3.54 were noticed respectively.

These findings get supported from the studies of Kandaswamy (1990), Patil *et al* (1993), Pampattiwar *et al* (1993), Muthuchamy *et al.* (2001) and Kannaiyan (2001).

The results further indicated that the cost of production under drip irrigation (Rs. 17609) has shown decrease to the extent of 13.60 per cent as compared to surface irrigation (Rs.20005). And also the net return (Rs. 41669) registered 12.83 per cent increase over surface method (Rs. 36321). Thus on the whole B:C ratio was higher under drip irrigation (1:3.36) as compared to surface method (1:2.81).

Similarly the higher B:C ratio in drip irrigation was also reported from Sahoo *et al* (2000). Also the findings of an increased yield was reported in the studies of Patil (1990) and Patil *et al* (1993). Where as, research results of Kandaswamy (1990), which highlighted the similar yield levels under drip and surface irrigation found to contradict the present results.

5.4.3 Comparison of quality parameters of banana (Yelakki bale) inter cropping grown under drip and surface method of irrigation

The results presented in the Table 13 indicates that the cultivation of banana crop under drip irrigation has shown the increased quality parameters like more number of hands per bunch (12), fingers per bunch (103), more length of fruit (4.73 inches) and fruit thickness (2.53inches) as

compared to the produce grown under surface irrigation (10, 92, 4.52 and 2.32 respectively).

The yellow colour of fruit was the added advantage for marketing as compared to light green fruit in surface irrigation. The absence of fruit cracking, controlled leaf spot and leaf yellowing, lesser days for harvesting (398 days) with increased self life (15 days) were the other quality benefits of drip irrigation as compared to surface irrigation method.

Similarly the comparative quality parameters of banana crop under drip irrigation were also reported by Patil (1990).

The benefits of above said quality parameters of produce shows that the respondents might have not reaped benefits of drip irrigation to the maximum extent which might be due to non-adoption of recommended management practices. Hence, the need for educating the farmers through demonstration and other extension activities in a planned manner by the concerned departments and agencies.

5.5 CONSTRAINTS FACED BY FARMERS IN ADOPTION OF DRIP IRRIGATION MANAGEMENT PRACTICES

It could be noticed from the observation (Table 14) that the problem in getting quality material was the top ranked constraint followed by no follow up services by drip agency. Around fifty per cent of farmers expressed the constraints like high initial investment cost, lack of capital to cover maximum holding under drip irrigation and delay in sanction of loan.

Similar constraints were also reported in the research studies of Phadtare *et al* (1992), Sheeba and Balaraj (1998) and Batta and Singh (2000).

Summary

VI. SUMMARY

Irrigation has been responsible for the fast growth in agriculture. In the present situation of stabilized land (145ha) irrigation assumes a greater significance to get increased production in the country, which could be achieved by sophisticated methods of irrigation like drip along with improved water management practices. The introduction of drip irrigation in India has gained momentum recently as panacea for many for of the problems in dry land agriculture and improving the efficiency in irrigated agriculture. Drip irrigation technology is technically feasible, economically viable and socially acceptable. The technology is sound enough to motivate the farmers to accept and adopt. In spite of all these drip irrigation technology is not catching up with the farmers to varied personal, socio-economic, situational, technological factors and unpredictable constraints. To support these at present a very few research studies have been conducted on knowledge and adoption of this technology. Similarly the advancement of drip irrigation in Karnataka had also accelerated the development of agriculture and horticulture. In the light of this it is of utmost important to study the scenario of drip irrigation farmers. Keeping all these in view the present study had been designed with the following specific objectives.

i. To study the personal, socio-economic and psychological characteristics of the drip irrigation farmers.

ii. To measure the extent of knowledge and adoption of drip irrigation management practices by the farmers.

iii. To study the extent of benefits derived from drip irrigation.

iv. To identify the problems encountered by farmers in adoption of drip irrigation.

The present study was conducted during 2002-03 in Shimoga and Davanagere districts of Karnataka. The ex post-facto research design was used for the study. A sample consisting of 90 drip irrigation farmers and 30 surface irrigation farmers were selected randomly from the purposively selected 23 villages coming under Shimoga, Shikaripura, Channgeri and Honnalli taluks, where maximum drip irrigated area in plantation crops exists.

The dependent variables included for the study were knowledge and adoption of drip irrigation management practices. A teacher made knowledge index about drip irrigation management practices was developed for the study. The other selected independent variables like personal, socio-economic and psychological characteristics were measured using already developed scales by the earlier researchers. The required data from drip irrigation was carried out using the scoring procedure developed for the purpose. Lastly the data were tabulated and analysed by using frequency, percentage, besides mean and standard deviation to draw the varied inference.

The salient findings of the study are as follows

Characteristics of drip irrigation farmers

- Comparatively more number of respondents were middle aged (40%) and high school educated (31.11%).

- A high per cent of drip irrigation farmers belonged to semi-medium land holding (46.67%) and medium drip irrigated area (64.45%) category.
- Half the respondents possessed high innovative proneness.
- Around fifty per cent of the sample farmers (45.56%) exhibited medium level of scientific orientation.
- Less than fifty per cent farmers possessed medium annual income (42.22%).
- Only one-third of farmers exhibited high-risk orientation.
- More number of respondents were member (60%) and office bearers (27.77%) of agricultural co-operative societies. But least participated in pahchayath institutions.
- Around fifty per cent of farmers were regular readers of Newspaper, where as use of radio and television programmes was noticed with 10 per cent and 34.44 per cent of farmers respectively.

Knowledge of drip irrigation management practices

- Moderate percentage of drip irrigation farmers (28.89%) were belonged to high knowledge level, where as, medium knowledge (38.89%) and low knowledge (32.22%) was noticed by one-third of respondents each.
- All the respondents possessed complete knowledge about selecting suitable soil for drip system, interval of opening laterals and desirable quantum of water release through drippers.

- A high per cent of farmers possessed the complete knowledge about conducting water and soil test and deciding of crops (80%) water saving through drip (68.88%) and cleaning drippers (64.44%).
- Around fifty per cent of respondents had complete knowledge regarding the purpose of practicing drip irrigation (44.44%), consideration of factors like land slope, water availability, spacing between crops and water requirement of crop (42.22%).
- Around one-third of farmers possessed the desired knowledge of cleaning the parts of drip system (34.44%).
- Around one fourth of respondents had the complete knowledge of selection suitable land for laying drip system and the requirement of water tank for pumping water through drippers.
- A very less percentage of farmers possessed the required knowledge regarding the essential parts of drip system (2.22%), purpose of using chlorine (8.88%), type of fertilizer to be used for fertigation (16.67%)and interval of opening laterals.
- None of the respondents possessed the complete knowledge of selecting suitable crop for drip irrigation and ideal interval of cleaning drippers.

Adoption level of drip irrigation management practices

- More number of drip irrigation farmers was noticed in medium adoption level (55.55%), followed by low (23.33%) and high (21.11%) adoption of recommended drip irrigation management practices.

- A more moderate per cent of farmers (21.11%) were followed all the recommended practices like conducting water test, soil test, land mapping, water availability and preparing cropping pattern before installing the drip system.
- All the respondents were used the end cap and repairing the parts of drip system.
- Around fifty percentage of respondents had followed the recommended interval of opening end caps (51.11%) and cleaning screen filters (50%).
- Moderate percentage of farmers had the recommended practice of opening ends of lateral (30%)and cleaning the system (25.55%).
- A less percentage of respondents were using chemicals for cleaning the system (4.44%) as recommended.
- None of the respondents were completely adopted the recommended practices like following stipulated time for irrigating a unit area and fertigation method.

Benefits derived through drip irrigation

- The majority of drip irrigation farmers had expressed the advantages like saving of water (95.55%), saving in labour cost for irrigation (92.22%) and uniform application of water (91.11%). Improved quality of the produce was expressed by seventy per cent of farmers.

- Half the respondents perceived the drip irrigation as an easy method of irrigation. While the benefit of decreased weed growth was expressed by twenty per cent of farmers.

- Drip irrigation had shown increased yield in arecanut and banana to the extent of 5.94 and 3.54 per cent respectively as compared to surface irrigation, similarly the increased return to the extent of 5.92 and 3.54 per cent was observed respectively.

- The cost of production under drip irrigation (Rs. 17609/ac) had benefited to the extent of 13.61 per cent as compared to surface irrigation method (Rs. 20005/ac). Also the net return by drip system (Rs. 41669/ac) had shown 14.72 per cent increase over surface irrigation (Rs. 36321/ac). Finally drip irrigation had resulted in higher B:C ratio (1:3.36) as compared to surface irrigation (1:2.81).

- The quality parameters of banana (Yelakki bale) crop grown under drip system had shown more number of hands per bunch (12) fingers per bunch (103), length of fruit (4.73 inches) and fruit thickness (2.53inches) as compared to the parameters shown in the produce given under surface irrigation (10, 92, 4.52 and 2.32 respectively) method.

- The drip irrigation had minimized the days for harvesting (398 days) and also increased self-life (15 days) as compared to surface irrigation (435 and 10 days respectively).

- Non-availability of quality materials (95.55%) and no follow up services by drip agency (81.11%) were the major constraints in adoption of drip irrigation management practices.

- High initial investment cost (62.22%), lack of capital to cover maximum holding under drip irrigation (56.66%) and delay in sanction of loan (53.33%) were the other major constraints in successful adoption of recommended irrigation management practices.

IMPLICATIONS OF THE STUDY

To attain efficiency and increased productivity through drip irrigation, it is the effective transfer of technology, which plays the significant role. In this context, the implications, which need immediate attentions of the concerned implementing agencies, development departments, policy makers, planners and other for efficient operation of the system, are listed below.

- It was observed that the majority of drip irrigation farmers were lacking the complete knowledge about selecting suitable crops for drip irrigation, the essential parts of drip system, type of drippers, use of chlorine and the recommended interval of cleaning the parts of drip system. Hence to create awareness in these practices there is a need to organize effective extension activities like regular training programmes, demonstration, campaigns and regular farmers

meeting by the concerned State Department of Horticulture, drip irrigation agency and other development departments.

- The scenario of adoption of drip irrigation management practices shows that none of the sample farmers had followed stipulated time in irrigating a given area and also the practice of fertigation. Similarly a high per cent of respondents did not completely adopted the practices like conducting preliminary tests for installing drip cleaning and opening the essential parts of system at the desired interval. Thus necessitates the establishing of model drip irrigation demonstration farm in order to develop skills and confidence among the farmers to properly use the drip system.

- A high percentage of respondents had low scientific orientation, risk orientation, organizational and mass media participation, which may a rise as the farmer in effective adoption of scientific irrigation management practice hence, these should be taken into consideration by the extension workers in concentrating the efforts.

- The constraints like non-availability of quality materials and technical information followed by high initial cost, lack of capital for covering entire area under drip irrigation and delay in sanction of loan gives the clear direction for the planners, administrators, policy makers and extension personal of the State Department of Horticulture, drip irrigation agencies, financing institutions and others to supply adequate standard parts by manufacturing and other appropriate measures to ensure the satisfactory situation for the development and improvement of drip irrigation.

- By and large the adoption of drip irrigation was not satisfactory looking to the benefits derived by farmers hence all the efforts should be made to provide the timely technical information, inputs, credit and market.

- Research efforts should be concentrated to design a suitable drip irrigation technology by considering the crop, season and soils of major location. Also by reducing capital cost requirement, the effort should be directed to design a drip system which should be economically viable socially acceptable and technologically feasible.

SUGGESTIONS FOR FUTURE RESEARCH

The present investigation is an attempt to study the knowledge and adoption of drip irrigation management and the socio-economic profile of drip irrigation farmers selected in four taluks of Shimoga and Davangere districts. Therefore it is suggested that a comprehensive research project may be taken up covering the entire drip irrigated area with ranging ecological, situational and socio-economic backgrounds. Thus the study will to help to take valid generalizations regarding the knowledge and adoption of drip irrigation management and the possible constraints in adoption of recommended practices, which could be of greater significance to design efficient maintaince of drip system by over coming the causes of failures and other maintaince problems.

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Appendix

APPENDIX I:

State wise area under drip irrigation in 1999-2000

Sl. No.	State	Area (ha)	Percentage
1	Maharashtra	39924	46.91
2	Karnataka	16767	19.70
3	Andra Pradesh	11585	13.61
4	Tamil Nadu	5357	6.29
5	Gujrath	3560	4.18
6	Kerela	3035	3.57
7	Madhya Pradesh	3415	4.01
8	Rajastan	304	0.36
9	Assam	180	0.21
10	Haryana	120	0.14
11	Uttar Pradesh	111	0.13
12	West Bengal	100	0.12
13	Other states	756	0.67
	Total	85103	100.00

Source: Anonymous (2002)

Scenario of drip irrigation in Karnataka 1991-92 to 2000-01

Sl. No.	Districts	Area (ha)
1.	Banglore (U)	17070.67
2.	Banglore (R)	2269.80
3	Chitradurga	12615.97
4	Kolar	2266.49
5	Shimoga	9400.89
6	Tumkur	9817.04
7	Mysore	5935.83
8	South Canara	3843.35
9	Chickmanglore	6738.67
10	Coorge	402.24
11	Mandaya	1577.12
12	Hassan	4739.11
13	Belgaum	2327.27
14	North Canara	2357.76
15	Bijapur	9780.15
16	Dharwad	2147.61
17	Gulbarga	2226.12
18	Rachiur	2556.66
19	Bellary	2331.49
20	Bidar	887.74
21	Davangere	4013.81
22	Chamarajanagar	775.68
23	Udapi	205.30
24	Bagalkot	469.71
25	Haveri	337.16
26	Gadag	354.24
27	Koppal	259.00
	Total	**92383.88**

Source: Anonymous (2002

Different crops under drip irrigation in Karnataka (2000)

Sl. No.	Crop	Area (ha)
1.	Coconut	27,784
2.	Arecanut	11,139
3.	Mango	6,286
4.	Grapes	3,983
5.	Sapota	1,139
6.	Sugarcane	652
7	Oil seeds	1,694
8.	Pulses	858
9.	Cotton	53

Source: Anonymous (2002)

APPENDIX - II

University of Agricultural Sciences

Department of Agricultural Extension Education

Agriculture College, Dharwad

INTERVIEW SCHEDULE

1. Name of the farmer:

2.Village :

3.Taluk :

4.District :

5.Age :

6.Education: Illiterate/Primary school/ Middle school/High school/ Pre-University/Degree

7.Social participation:

Name of the organisation	Nature of participation		Extent of participation		
	Member	Office bearer	Regularly	Occasionally	Never
Village Panchayat					
Taluk Panchayat					
Zilla Panchayat					
Agricultural Co-operative society					
Others (specify)					

8. Mass media participation:

Mass media	Extent of participation		
	Always	Sometimes	Never
News paper			
Krushi patrike			
Television			
Radio			
Others (specify)			

9. Land holding:

Type of land	Dry land	Irrigated land	Garden land
Area (ha)			
Corps			

10. Area under drip irrigation:

	Area	Crop	Year of installation
Irrigated land			
Garden land			

11. Family income:

Crop	Area	Yield		Cost of cultivation		Price	
		Before	After	Before	After	Before	After

Income from others sources (specify): Rs._____

12. Risk orientation: Following are the statements to measure the risk orientation of farmers, please indicate your degree of opinion for the following statements (SA- Strongly agree, A-agree, UD-Undecided, DA-Disagree, SDA- Strongly Disagree)

Statements	Responses				
	SA	A	UD	DA	SDA
1. A farmer who is willing to take risk than the average farmer usually does better					
2. Farmers should take more chance in making of more profit than to be context with a smaller but less risky profit.					
3. A farmer should grow large number of crops to avoid greater risk involved in growing one or two crops.					
4. It is good for a farmer to take risk when he knows his chance of success is fairly high.					
5. Trying an entirely a new practice/method in farming by a farmer involves risks but it is worthy.					
6. It is better for a farmer not to try new farming methods unless most of the other farmers have used them with success.					

13. Scientific orientation: Following are the statements to measure the Scientific orientation of farmers, please indicate your degree of opinion for the following statements (SA- Strongly agree, A-agree, UD-Undecided, DA- Disagree, SDA- Strongly Disagree)

Statements	Responses				
	SA	A	UD	DA	SDA
1. New method of farming gives better results to a farmers than old methods 2. The way a farmers forefather doing is still the best way to farm today 3.Even a farmer with lot of experience should use new methods of farming 4. Though it takes time to learn new methods in farming it is worth the efforts 5. A good farmer experiments with new ideas in learning 6. Traditional method of farming have to be changed in order to raise the level of living by a farmer					

14. Innovative Proneness: Following are the statements to measure the Innovative Proneness of farmers, please indicate your degree of opinion for the following statements (SA- Strongly agree, A-agree, UD-Undecided, DA- Disagree, SDA- Strongly Disagree)

Statements	Responses				
	SA	A	UD	DA	SDA
1. I try to keep myself upto date with information on new farm practices, but that does not mean that I try out all the new methods on my farm.					
2. I feel restless till I try out a new farm practices I have heard about.					
3. They talk of many farm practices these days, but who knows if they are better than old ones.					
4. From time to time I have heard of several new farm practices and I have tried out most of them in the last few years.					
5. I usually wait to see that what results my neighbours obtain before I try out the new farm practices.					
6. Some how I believe that a traditional ways of farming are the best					
7. I am cautious about I am trying a new practice.					
8. After all our forefathers were wise in their farming practices and I do not seen any reason for changing these old methods					
9.Often new farm practices are not successful however, I should surely like to adopt them.					

PART - B

KNOWLEDGE OF DRIP IRRIGATION FARMERS ABOUT SELECTED MANAGHEMENT PRACTICES IN DRIP IRRIGATION

1. Main purpose of drip irrigation
   a. To provide same quantity of water
   b. To save water
   c. To increase area under drip irrigation
   d. As an easy method of irrigation
   e. All the above
2. Suitable soil of drip irrigation
   a. Less water available area
   b. Maximum water available area
   c. Salt water situation
   d. All the above
3. Suitable crop for drip irrigation
   a. Horticulture crops
   b. Commercial crops
   c. Leguminous crops
   d. Paddy crop
   e. All the above
4. Suitable soil for drip irrigation
   a. Black soil
   b. Red soil
   c. Sandy soil
   d. All the above
5. Measures to be taken before installation of the system
   a. Conducting water test
   b. Conducting soil test
   c. Deciding of crops
   d. All the above
6. Important factors to be considered while installing of the system
   a. Availability of water
   b. Slope of the land
   c. Spacing between the crops
   d. All the above

7. Facility required for installation of the drip system
   a. There should be water tank
   b. Directly we can give water for drip irrigation
   c. Either of the above
8. Chouse/select the essential components of the drip system
   a. Air releasing valve
   b. Valve
   c. Non-returning valve
   d. End cap
   e. Laterals
   f. Connectors
   g. Filters
   h. Fertigation tank
   i. Pressure guage
   j. All the above are required
9. Type of dripper you know
   a. Removable type
   b. Unremoveable type
   c. Small drip pipe
   d. Bubbler
   e. Circulating sprinkler
   f. Circulating small sprinkler
   g. Jet type
   h. Pressure regulator
   i. All the above
10. When one should close the channels opened for installation of system
   a. After putting all the pipes
   b. After putting all the pipes and laterals
   c. After completion of all joints
   d. After operating the system
   e. All the above are essential

11. Frequently cleaned components of drip system are
    a. Filter
    b. Drippers
    c. Pipes
    d. Laterals
    e. All the above
12. The main purpose of using chlorine
    a. To maintain PH of the water
    b. To clean the drip system
    c. To give chlorine to crops
    d. All the above
13. Type of fertilizer can used for fertigation
    a. Liquid form of fertilizer
    b. Water soluble form of fertilizers
    c. Both forms of fertilizers
14. Through drip system amount of water can be saved:_____
15. Interval of opening of end cap
    a. Every day
    b. Once in a week
    c. Once in two weeks
    d. Once in a month
16. Interval of opening laterals
    a. Once in a week
    b. Once in two weeks
    c. Once in a month
17. Interval of opening screen filters
    a. Every day
    b. Once in two days
    c. Once in a week
18. Interval of checking quantum of water release
    a. Once in two weeks
    b. Once in a month
    c. Once in six months
    d. Once in a year

19. Interval of cleaning of drippers/emitters

a. Once on a week
b. Once in two weeks
c. Once in a month

Extent of adoption of drip irrigation system

1. Before installation of drip system what measures you have taken

a. Testing of water quality
b. Soil testing
c. Preparing cropping pattern
d. Land maping
e. Availability of water
f. Slope of the land
g. All the above

2. Did you personally examine the location/place of joints/pipes, while installing drip system? Yes/No

3. While installing drip system what measures you have observed?

i. While opening channels whether you noticed the bottom is soft or filled with stones? Yes/No

ii. Have you examined any leakage of water with the joints? Yes/No

4. When you are going to open the End cap?

Every day/ Once in a week/ Once in two weeks/ Once in a month/ Once in six months/ once in a year/ Not yet opened so for.

5. When you going to open the laterals?

Every day/ Once in a week/ Once in two weeks/ Once in a month/ Once in six months/ once in a year/ Not yet opened so for.

6.When you are going to open the Gravel/sand filters?

Every day/ Once in a week/ Once in two weeks/ Once in a month/ Once in six months/ once in a year/ Not yet opened so for.

7. How offentely you are opening the Screen filters?

Every day/ Once in two days/ Once in week/ Once two weeks/ Once in a month/ Once in six month/ Once in a year/ Not yet opened so for

8. Did you used any chemicals for cleaning the system? Yes/No

If yes, Mention the name of chemical and its much quantity you used

a. Bleaching power
b. Calcium hypo chloride
c. Sodium hypo chloride
d. Chlorine gas
e. Copper Sulphate
f. Hydro chloric acid
g. Others (Specify)

9.To determine the release of uniform quantity of water by the emitters how offentely you are checking the system

Once in a week/ Once in two weeks/ Once in a month/ Once in six months/ once in a year/ Not yet opened so for.

10. Whether you are following the stipulated time for irrigating the crop as decided by the designer? Yes/No

11. Which of the following you adoptedin your drip system?

a. Air releasing valve
b. Valve
c. Non-returning valve
d. End cap
e. Laterals
f. Connectors
g. Filters
h. Fertigation tank
i. Pressure guage

13. Type of fertilizer used for fertigation

a. Liquid form fertilizer
b. Water soluble fertilizer

14. The drip system components types oftenly cleaned

a. Pumps
b. Filters
c. Drippers
d. Laterals
e. Pipes

15. Which type of drippers you installed?

a. Removeable type

b. Unremoveable type

c. Small drip pipe

d. Bubbler

e. Circulating sprinkler

f. Circulating small sprinkler

g. Jet type

h. Pressure regulator

16. Did you practice repairing any parts of system, Yes/No

If yes name the parts you repaired.

a.

b.

c.

d.

PART -C

1. Mention the benefits derived through drip irrigation

a.

b.

c.

d.

e.

f.

g.

h

2. Comparison of quality parameters of banana crop under drip and surface method of irrigation

Sl. No.	Parameters	Drip irrigation	Surface irrigation
1.	Average length of fruit (inch)		
2.	Average thickness of fruit (Inch)		
3.	Average number of hands/bunch		
4.	Average number of fingers/bunch		
5.	Average yield (qt/ac)		
6.	Colour of fruit		
7.	Cracking of fruit/bunch		
8.	Incident of leaf spots & yellowing of leaf		
9.	Average number of days taken for harvesting		
10.	Keeping quality after (number of days)		

3. Constraints of drip irrigation

a.

b.

c.

d.

e.

f.

g.

h.