A STUDY ON KNOWLEDGE, ADOPTION AND PERCEPTION OF USEFULNESS OF AGRO-FORESTRY PRACTICES BY FARMERS OF HANGAL TALUK, DHARWAD DISTRICT

SANGAPPA B. BELLIGERI

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION

UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD - 5

AUGUST, 1996

A STUDY ON KNOWLEDGE, ADOPTION AND PERCEPTION OF USEFULNESS OF AGRO-FORESTRY PRACTICES BY FARMERS OF HANGAL TALUK, DHARWAD DISTRICT

Thesis submitted to the

University of Agricultural Sciences, Dharwad

in partial fulfillment of the requirements for the

Degree of

Master of Science

IN

AGRICULTURAL EXTENSION EDUCATION

BY

SANGAPPA B. BELLIGERI

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION

UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD - 5

AUGUST, 1996

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION
UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD

C E R T I F I C A T E

This is to certify that the thesis entitled **"A STUDY ON KNOWLEDGE, ADOPTION AND PERCEPTION OF USEFULNESS OF AGRO-FORESTRY PRACTICES BY FARMERS OF HANGAL TALUK, DHARWAD DISTRICT"** submitted by **Mr. SANGAPPA B. BELLIGERI** for the degree of **MASTER OF SCIENCE IN AGRICULTURAL EXTENSION EDUCATION**, of the University of Agricultural Sciences, Dharwad, is a record of research work carried out by him during the period of his study in this University, under my guidance and supervision and the thesis has not previously formed the basis of the award of any Degree, Diploma, Associateship, Fellowship or other similar titles.

DHARWAD
DATE :

(L. MANJUNATH)
ASSOCIATE PROFESSOR AND
MAJOR ADVISOR

Approved by :

Chairman : (L. MANJUNATH)

Members 1 (B. SUNDAR SWAMY)

2 (M.R. ANSARI)

3 (V.S. YADAV)

AFFECTIONATELY

DEDICATED

TO

MY

LATE FATHER

B. G. BELLIGERI

ACKNOWLEDGEMENT

I express my esteem and profound sense of gratitude to SHRI L. MANJUNATH, Associate Professor, Directorate of Extension, University of Agricultural Sciences, Dharwad and Chairman of my Advisory Committee for his keen interest, valuable guidance, kind encouragement and constructive criticism during the investigation and organisation of this thesis. His sympathy and generosity have been much beyond his formal obligation as the Chairman of my Advisory Committee for which I am deeply indebted to him. My sincere thanks are due to him for the time, he willingly spared even midst of his busy schedule works.

I record my sincere appreciation and gratefulness to the members of my Advisory Committee, Dr.B.Sundaraswamy, Professor of Agricultural Extension Education, Dr.M.R.Ansari, Associate Professor of Agricultural Extension Education and Shri. V.S. Yadav, Assistant Professor of Psychology, U.A.S., Dharwad, for their valuable suggestions and guidance during the course of my study.

I am overwhelmed with sincere feelings of indebtedness to my mother Smt. Neelakka, my brothers Basappa, Shivappa and sisters Chandrakka, Gourakka, Kasturi, Kamala and Mahadevi, whose predilections and wishes motivated me to work towards the cherished goal.

I shall be failing in my duty if I don't gratitude my thanks to Dr.B.S.Nadagoudar, Dr.S.L.Madiwalar, whose selfless help and encouragement in accomplishing this thesis.

I acknowledge with pleasure the Indian Council of Agricultural Research, New Delhi for having awarded me the Junior Fellowship.

I like to extend my sincere thanks to all my friends particularly to Ashok, Siddanna, Somanna, Shivu Patil, Gangappa Gaddi, Jagannath Olekar, G.M.Hiremath, Shripad, Manju, Deepak Haradikar, Arun, Raju Teggelli, S.P. Yeligar, Vanamala, Ravindrakumari, Shoba and others for their help throughout the course of my study.

Finally, I wish to thank M/s.Megabyte Computers for neat typing of this thesis.

Dharwad

August, 1996.

(**SANGAPPA B. BELLIGERI**)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

I INTRODUCTION

Trees and forests are an integral part of the Indian culture. The best of Indian culture was born in the forests. The Aryan civilization was cradled in our forests and our 'Rishis' who evolved the Hindu philosophy lived in forests in complete harmony with nature. The ashrams were the centers which harmonised agriculture and pasture with trees, animals and birds. Lord Budha sought the shelter of 'bodhi' tree and got enlightened. Many trees are worshiped even today, we have records of 'kalpabriksh' which could satisfy all human needs.

In India, agriculture and forestry have co-existed for many years in close proximity. Agro-forestry system of land use is not new to our rich heritage. The term 'Agro-forestry' is new name for old practice. From time immemorial farmers have been growing useful tree species with agricultural crops which used to supply fodder, fuel and small timbers for himself and fodder to his livestock.

Agro-forestry system of land use has immense utility for mankind. Because it provides food, fodder, fruits, fuel, fertilizer., maintains ecological balance, reduces global warming leads to protection of all living beings on the earth from direct sun rays. Over and above it helps for effective land management.

Agro-forestry has gained more importance in the last 5-6 years in the succession to the taungya system of agri-silviculture. Agro-forestry can be defined as "sustainable land management system which increases the over all yield of the land combines the production of crop including tree crop and/or animals

simultaneously or sequentially on the same unit of land and applies management practices that are compatible with cultural practices of the local population" (King and Chandler, 1978).

In agro-forestry production system trees protect the agricultural crops in the dry inhospitable climate by conserving soil moisture, increasing the atmospheric humidity and by providing protective cover from scorching and dissicating winds, increasing soil fertility thereby stepping up agricultural yields and ensuring supply of much needed food, fuel, fodder, and timber.

Agro-forestry system has several objectives such as, to use farm resources properly, to maximise per unit production of food, fuel, fodder, livestock and other products,to reduce pressure on protective and productive forests, to maintain ecological balance, to conserve soil moisture, check soil erosion and increases soil fertility. Hence, agro-forestry helps in maintaining sustainability in agriculture.

A panorama of the Indian agriculture had apparently revealed that the per capita land and income availability from agricultural sector have been shrunken to an enormous extent. Despite, many development programmes in agriculture for farming community, the state of the farmers is pathetic. It is mainly due to low productivity, high input cost, devasting droughts, dwindling and erratic rainfall.

At present, environmental improvement is the great concern of the world. Continued deforestation leads to global warming (Greenhouse effect), ozone depletion, acid rains etc. Hence, planting of trees in forest area, less fertile and

waste lands of individuals is an important means to overcome the environmental hazards.

India has 2.2 per cent (329 m.ha) of world's geographical area (14900 m.ha) and 1.88 per cent (75.2 m.ha) of world's forest area (3800 m.ha). The human and cattle population that India accounts to around 15 per cent and 14 per cent of the world's total human and cattle population, respectively. While karnataka state has total geographical area of 19.2 million hectare with a population of 44 million. The forest area in the state is 3.86 m.ha. accounting to 20 per cent of the total geographical area of the state as against 23 per cent of all India average and 33.33 per cent as envisaged in the National Forest Policy. Thus, Karnataka represents 5.51 per cent of the country's population occupying 5.85 per cent of the country's area. The per capita forest area in the state is just 0.10 hectare. In India, with respect of firewood, as against the estimated requirement of about 15.7 crore tonnes of fuel wood per annum while the recorded production is only 5.8 crore tonnes, due to scarcity of firewood, considerable quantities of cow dung and agricultural residues are burnt as fuel leading to air pollution.

Population explosion in India has increased pressure on land, forests and forest products. The area under forests is shrinking year by year and the demand for forest products is ever increasing. Moreover, there is huge gap between deforestation and afforestation. If this trend continued, fuel wood shortage may become a more serious problem than food.

Government of India projected the major issues like poverty alleviation and unemployment, these can remain only as Utopian goal unless the

people below poverty line is freed from the shackles of excruciating misery through the sustained development of the land resources, being an intangible need on the other side. In this context, proper integration of trees with field crops seems to be better alternative to meet sustained use of land, water and human resources.

Government of India implemented several programmes for conservation and development of forest. Namely, distribution of seedlings to the public at nominal rate, conducting Vanamahotsava to create awareness of trees and their role in environment protection, people involvement through Forest Planning and Management (JFPM) programme, providing incentives at the rate of Rs.2 per plant for retaining plants on the farms, booking cases for illegal cutting of trees. In addition to this, Government implemented Forest Conservation Act, 1980 to avoid release of forest lands to public for agriculture use by the State Government.

Several studies have been conducted on many aspects of forests but perception of farmer about utility of forests is forgotten.

It was therefore, felt necessary to take up an appraisal study on the knowledge adoption and usefulness of agro-forestry practices as perceived by the farmers, with the following objectives.

1. To measure the knowledge level of farmers about agro- forestry practices.
2. To know the extent of adoption of agro-forestry practices by the farmers.
3. To study the perception of usefulness of agro-forestry practice by the adopters.
4. To find out the motivational factors influenced to adopt agro forestry practices.
5. To work out association between the socio-economic characteristic of farmers and its association with knowledge.

6. To identify the problems encountered by the farmers while adopting agro-forestry practices.

7. To obtain the suggestions for better adoption of agro- forestry practices.

Importance of the study

The result of the study would help the concerned extension agencies, researchers, policy makers to extend their infrastructure for better adoption of agro-forestry practices by the farmers. It also helps to take appropriate measures to overcome practical difficulties in accepting agro-forestry practices and help to modify the practices, if possible.

Limitations of the study

All the social science researchers have their own limitations and this study is no exception.

1. This study has limitations of time and resources of investigator. Also, generalization of this study would be restricted to the areas where similar conditions prevailed.

2. Although the investigator has taken all precautions to achieve objectives in the study. The change of bios cannot be completely eliminated.

Inspite of these limitations, it is hoped that this study would provide a background to understand the adoption pattern of different agro-forestry practices and perception of usefulness of these practices. Thus, this study becomes meaningful to planners, policy makers, extension personnel and the scientists involved in the agro-forestry research.

REVIEW OF LITERATURE

II REVIEW OF LITERATURE

Past studies pave way for future research endeavours. A comprehensive and critical review of the previous research studies provides a broad and general background for scientific investigation. An acquaintance with earlier studies is a must to develop good understanding of the present study and to formulate appropriate research methodology. It also lands support for the interpretation of the findings.

In view of the limited studies conducted in the area of agro-forestry, closely related studies are also reviewed and presented in the sequence indicated below.

2.1. Concept of agro-forestry.

2.2. Knowledge level of farmers about recommended cultivation practices.

2.3. Adoption of recommended cultivation practices by the farmers.

2.4. Perception of usefulness of recommended cultivation practices.

2.5. Motivational factors influenced to adopt agro-forestry practices.

2.6. Personal and socio-economic characteristics of the farmers.

2.7. Association between selected independent variables with knowledge.

2.8. Problems experienced by the respondents while adopting agro-forestry practices.

2.9. Suggestions of the farmers for better adoption of agro- forestry.

2.1 Concept of agro-forestry

Agro-forestry is an age old practice followed in different forms, but recently it has assumed immense importance. The main theme of agro-forestry is

optimisation of land use system. It is interdisciplinary approach to systems of landuse based on agriculture, forestry, animal husbandry including pasture, acquaculture, fisheries, land resource management and other disciplines which all form the systematic background of landuse.

Agro-forestry has been defined as a sustainable land management system which increases the yield of land combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially, on the same unit of land and applies management practices that are compatible with the cultural practices of the local population (King and Chandler, 1978).

Goswamy (1982) defined agro-forestry as multiple land use practice involving trees, food or forage crops and live stock raised simultaneously or sequentially in a single farming system.

Huxley (1983) opined that agro-forestry systems provide multiple output from the same unit of land in a sustainable way, and that there are in some form or the other, interaction between the two or more constituent plant species one of which at least (and by definition) is a woody perennial (such as bush, palm, vine, bamboo etc.).

Singh and Korwar (1986) defined agro-forestry as a collective term for a land use system in which woody perennials (trees and/or shrubs) are deliberately combined on the same land management unit as crops or animals either in some form at spatial arrangement or in sequence.

2.2 Knowledge level of farmers about recommended cultivation practices

Ajayakumar (1989) conducted a study on grape growers in Ranga Reddy district of Andhra Pradesh, he found that there were more or less equal number of grape growers with high (35%) and medium (38%) level of overall knowledge of improved grape cultivation practices. It was encouraging to note that only few (27%) of the grape growers had low level of overall knowledge of improved grape cultivation practices.

Joshi and Sharma (1989) conducted a study in randomly selected 20 villages of Valsad district of Gujarat State, revealed that knowledge of forestry technology was significantly correlated ($r=0.289$) with success of social forestry programme.

Ratnakar (1990) reported that majority (56.9%) of the beneficiaries of ITDA had medium level of knowledge with respect to Mango cultivation whereas majority (81.20%) of non-beneficiaries had low level of knowledge in Khammam district of Andhra Pradesh.

Badiger *et al.* (1991) conducted a study on knowledge and participation of farm women forestry, in Kalkeri village of Dharwad taluk, Karnataka State. The results of the study revealed that farm women had very good knowledge regarding usefulness of forestry. They had appropriate knowledge to a larger extent about the role of forestry in air purification, receiving rains, medicinal values of forestry plants, usefulness of wood and wildlife protection. Few women lacked the knowledge about importance of vanamahotsav, soil fertility and erosion.

Umale *et al.* (1991) conducted a study in 20 villages of Malegaon and Barshitakli blocks having maximum area under agro-forestry, in Akola district, and reported that majority (56.25%) of the respondents have medium knowledge followed by low (27.08%) and high (16.67%) knowledge about agro-forestry trees.

Nimje *et al.* (1991) conducted a study on knowledge and skills about Ber cultivation practices among farmers, in Washim taluka of Akola district and reported that respondents had high (77.33%) level of knowledge of the recommended ber cultivation practices, but low skills.

Bhople *et al.* (1991) conducted study entitled, 'constraints in adoption of dryland technology in Akola Panchayat samit; of Akola district of Maharashtra, which revealed that the alternate land use patterns constitute planting of fruit and fodder trees. In these alternative land use patterns more than 60 percent of the farmers did not know and adopt any practice on farm. Nearly one-third of the farmers (32%) were aware and one-fourth of the farmers (25.60%) had adopted upto two recommended practices under alternate land use patterns.

Chand and Sharma (1993) conducted the study on knowledge and adoption of recommended apple cultivation technology through lab to land programme, in Himachal Pradesh. It could be seen from the result that majority as the respondents had knowledge about the recommended cultural management practice (knowledge Index=83.55) and establishment of plantation (knowledge Index=80.75). The knowledge index also showed that the beneficiaries' knowledge about pruning system, pre and post harvest technology, fertilizer application and plant protection measures were not upto mark.

Javale and Nachane (1994) conducted a study in Parbhani and Gangakhed taluk of district Parbhani (Maharashtra) and reported that about 79 percent of the cultivators possessed medium to high knowledge about citrus and mango cultivation.

Sadaquath *et al.* (1994) conducted a study in Gudnapur village of Sirsi taluka of North Canara district (Karnataka), which revealed that 66 percent of farmers had high knowledge about farm forestry. It was also noticed that maximum number of participant farmers had high knowledge regarding forest tree species and their cultivation aspects.

Hence, it could be generalised that there was variation in knowledge level of the respondents about recommended practices, but most of the farmers were having medium knowledge level.

2.3 Adoption of recommended cultivation practices by the farmers

Sainath (1982) conducted a study in Bangalore district of Karnataka State and reported that recommended grape cultivation practices like variety, training methods, proper spacing, pit size, number of buds at pruning etc., were adopted by all the grape growers. Also, revealed that all the grape growers had big land holdings. Further, there was positive and significant association between land holdings and adoption of grape cultivation practices.

Ajayakumar (1989) conducted a study on adoption behaviour and information consultancy pattern of grape growers in Range Reddy district of Andhra Pradesh. He reported that out of several recommended grape cultivation practices, suitable soil, recommended variety and training method of grapes were adopted fully by all

the grape growers. A large majority of them fully adopted the practices like proper spacing, pit size, time and number of buds at pruning, fertilizer application, plant protection measures, Gibberellic acid treatment, intercultural operations and method and time of harvesting. The practices which were adopted partially by a large majority of farmers were manures for pits and organic manure application. However, notable number of farmers did not adopt the practice, stopping of irrigation before harvest.

Cook and Grut (1989) reported that majority of the farmers have adopted the recommended technologies under standing the economics of agro-forestry systems from the farmers point of view as well as in the broader social context and considering the socio-economic level, age, gender of the people who were expected to adopt the proposed technology. The study was conducted in sub-saharan Africa.

Kantaraj (1989) conducted a study in Hassan district of Karnataka and reported that the overall adoption level as coffee growers was medium (40%) to high (32%) and similar trend was observed among cardamom growers, also.

Verma (1990) conducted a study on agro-forestry practices followed by farmers of Gujarat State, and reported that peripheral planting practice was adopted by marginal, small and large farmers to a greater extent, and was most prevalent in the moderate rainfall zone. Eucalyptus species were planted by 90 percent of farmers in agro-forestry systems.

Sinha *et al.* (1991) conducted a study in Dharni Tahsil of Melgat. The study revealed that fields were the most popular place for plantations than bunds

and fallow land. Majority of respondents (72.86%) planted fruit crops in fields followed by 55.71 percent respondents who planted them on bunds. The fallow land and banks of nalas were utilised by 28.24 percent of respondents.

Patil *et al.* (1991) conducted a study in all the three agro-climatic zones of the Vidarbha region, Maharashtra State and reported that farmers all over Vidarbha were almost not practicising agro-forestry systems. Only 13.33 percent farmers from central zone were observed to have accepted agri-horticultural pattern. The tree plantation on field bunds was common in the whole region. About 43 percent farmers were seen growing trees on bunds. Farmers were also conserved to grow agricultural crops as inter crops in fruit like santra.

Umale *et al.*(1991) conducted study in 20 villages of Malegaon and Barshitakali development blocks of Akola district and reported that majority of the respondents (89.58%) planted eucalyptus under agro-forestry. Bamboo and subabul were planted by 37.50 percent and 25.00 percent of the respondents, respectively. Only 12.50 percent planted Teak trees. Very few of the farmers planted other trees like Ber, Cashia, Siras, Prosopis and Mango.

Reddy (1992) conducted a study on mango growers in Khammam district of Andhra Pradesh to know adoption of improved mango production technology, and reported that recommended practices like suitable soil, variety, spacing, pit size, fertilizer application, time of harvesting were adopted by all the big farmers. Further, study revealed that there was positive and significant association between land holdings and adoption of improved mango production technology.

Lianbika and Nikhade (1993) conducted a study on pineapple growers in Mizoram and reported that cent percent of the respondents were using recommended improved variety, whereas nearly 80 percent used recommended time of planting, correct seed rate (i.e. recommended number of suckers/hectare) was used by 60 percent respondents. This is followed by 40 percent respondents who used recommended spacing. Adoption of other practices such as use of seed treatment, manures and plant protection measures were found to be very poor among the pineapple growers. Use of chemicals for flowering induction was found to be completely absent.

Saikh *et al.* (1993) revealed from their study in Purander Tahsil of Pune district, Maharashtra State, that almost all the growers were adopting the technology of soil requirement, spacing and filling of pits. While 50 percent farmers were adopting the recommended doses of fertilizers, less than 25 percent growers were adopting the technology of disease and pest control, transplanting by seedlings in July-August and irrigation practices. Only 11.67 percent growers were adopting the improved varieties, while none of the grower was using seed treatment.

Based on above studies it could be inferred that there was differential levels of adoption of recommended practices among farmers. However, only few studies have been reviewed relating to agro-forestry practices. Hence it would be interesting to study the extent of adoption of agro-forestry practices.

2.4 Perception of usefulness of recommended cultivation practices

Ravindra (1980) conducted a study entitled study of knowledge,

adoption and perception of recommended poultry management practices among poultry farmers of Bangalore district, reported that 65 percent of farmers perceived poultry farming as moderately suitable as against 10 percent of farmers who had perceived it as highly suitable to their conditions and 25 percent of than had perceived poultry farming as less suitable to their conditions.

Upadhyay and Hansra (1982) studied utility of Agriculture broadcasts as perceived by the farmers in Nepal. Majority (86.46%) of the respondents perceived the agricultural broadcasts as "Very much useful", whereas only 12.50 percent perceived that these broadcasts were "some what useful".

Veena Jain and Singh (1983) studied differential perception of farm women regarding immunization practice. The study was conducted in four villages of Hissar, Haryana State. They reported that majority of the respondents perceived immunization practice as profitable, physically incompatible, culturally compatible and simple.

Chandrakandan *et al.* (1989) studied farmer's perception on correspondence course programme of Tamil Nadu Agricultural University. The results indicated that majority of the respondents opined that the lessons were easily understandable, the courses had more practical utility and were highly useful to them.

Helin (1989) reported that more than half of the farmers had perceived the Principles of agro-forestry like possibility of getting poles and leaves, 38 percent had perceived the importance of trees as windbreak and 15 percent had perceived the importance of trees over soil erosion and protection.

Lanjewar and Shirke (1991) studied the perception of social forestry by farmers of Nagpur district of Maharashtra State, and reported that among the different objectives namely helping rural population in fulfilling their needs, of fuel fodder and small timber. Regarding the importance of social forestry, majority of the respondents perceived it as important since it helps to use the waste lands (93.33%), can help the farmers earn money with less labour (86.66%), can help in making available small timber and poles (77.77%) easy to supervise and cost of labour is saved (71.10%).

Nimje *et al.*(1992) studied the perception of participants of national workshop on Dryland Agriculture Technology (DAT) and Citrus Fruit Production Technology, (CEPT) at Advanced centre for training on dryland agriculture, P.K.V. Akola. The study revealed that all the aspects regarding the contents of workshops viz, course content, visits and practical, information provided, opportunity to learn new skills, training techniques, latest techniques and skills bases were perceived as favourable by majority of the participants of both the workshops. With respect to usefulness of topics covered in workshop, all the topics covered were perceived as 'Very useful' by majority of the participant respondent. As high as 88.23 and 87.34 percent of them perceived that the topics covered in workshop enriched their knowledge.

Venkataprabhu (1993) studied perception pattern of the needs, importance and principles of agro-forestry by differential group of farmers. The study revealed that -(i) The Principles namely meeting fodders, fuel, fertilizers and fibre requirement, creating employment opportunity, enhancing ecological balance,

controlling soil erosion, serving as wind break to control wind erosion and providing stabilized long term income were found to be perceived to a large extent either fully or partially by all the categories of farmers to varied magnitudes, (ii) The perceived importance of agro-forestry comprised the following suitability of trees, less requirement of inputs like fertilizers, pesticides and manures, suitability for waste/barren/fallow lands, reali-sation of more income with less investment and a supporting role for crop/livestock enterprises by all the categories of farmers to varied degrees.

Thus, the studies reviewed above indicated that, majority of the respondents were perceived useful about the subject studied.

2.5 Motivational factors in taking up agro-forestry on the farm

Leach and Mearns (1988) stated that the cash incentives were the motivating factors in the economic aspects, for the successful interaction range from assistance to enhance traditional methods of land and woody biomass management through tree growing.

Mundra and Kothari (1988) conducted a study in Udaipur and Dungarpur district of Rajasthan and reported that most of the tribal women joining Training of Rural youths for self employment (TRYSEM) programme mainly because of economic security, followed by family need, economic-freedom, prestige, self actualisation, affiliative and innovative. It was also found that the most utilised sources of information for TRYSEM programmes was master trainers, mass media such as radio and hand bills (leaf sets).

Joshi and Sharama (1989) conducted a study in Valsad district of Gujarat, reported that there was positive and significant association of economic motivation (r = 0.369) of the farmers with their success of farm-forestry programme.

Muthayya and Loganathan (1990) conducted a study in Hyderabad district of Andhra Pradesh State and reported that the sources of influencing beneficiary's motivation in undertaking different activities related to their occupation, the respondents had taken decisions on their own in procuringraw materials, fixing market price and marketing their products.

Gill (1991) reported that the farmers have practiced agro-forestry for generation and have grown trees for fruit, fodder, food, fuel and timber and they were motivated by self to attend the seminars, lectures, field visits and in addition, the government agencies and organisation of private sector also lead to a significant adoption of agro-forestry.

Pujar (1993) conducted a study in selected talukas of Dharwad district of Karnataka State and reported that the motivational factors for the women to attend the K.V.K training programmes were to get more information (90%), to learn new skills (53.50%), for better use of leisure time (34%), to learn new ways of earning money by using less cost resources (33%) and to get solution for some of the problems in their present occupation (17%).

Javale and Nachane (1994) conducted a study in Parbhani district of Maharashtra State, reported that the beneficiaries had participated in the

horticultural development programme mainly because of financial support from the Government and assurance of income in future from raising of the orchards. About 25 percent of the beneficiaries were attracted towards the programme due to the fact that, to raise these horticultural crops initial expenditure was provided by the Government secondly about 18 percent opined that, there was guarantee of income from orachard. The other motivating important factor was observed to be suitability of land and interest of beneficiaries. As regards to the motivational agencies, the Government officers, friends and village level workers were the most important agencies for motivation.

2.6 Personal and socio-economic characteristics of farmers

2.6.1 Age:

Joshi (1992) in his study on paddy cultivation pattern by Tibetan rehabilitants and their socio-economic characteristics in Mundgod taluk of Karnataka, noticed that half of the respondents belonged to middle age category and about 30.00 percent of the respondents were in old age category. In the young age group, there were 19.00 percent of the respondents.

Naik (1993) in his study on awareness, attitude and use pattern of seed supplying agencies by farmers in Dharwad district of Karnataka State, noticed that 73.00 percent of the respondents belonged to meddle age category. In the young age group, there were only 4.00 percent of the respondents.

Channal (1995) conducted a study in Belgaum district of Karnataka State on share holders and non-share holders of co-operative sugar factory and reported that more than fifty percent of the share holders and non-share holders were in the age

group of 35-50 years. Twenty percent of share holders and 24 per cent of non-share holders were above 50 years of age followed by 18 percent and 26 percent of share holders and non-share holders were less than 34 years of age.

From the above reviews, it could be generalised that majority of the farmers belonged to meddle age group.

2.6.2 **EDUCATION:**

Thimmappa (1981) conducted a study in Tumkur district of Karnataka State on coconut growers, and reported that 57.00 percent of them were less educated and remaining 42.50 percent were highly educated.

Khandagode (1982) conducted a study on citrus growers in Nagapur district of Maharashtra State, and reported that two-fifth of citrus growers were educated upto 4th standard, 27 percent of them were educated upto 9th standard while more than one-fifth of them were illiterate. Eight percent and three percent respondents were educated upto matriculation and graduation level, respectively.

Reddy (1983) conducted a study in Tungabhadra project area in Karnataka state, and found that majority (49.33%) of banana growers were belonged to low education category followed by high education category (32%) while 18.67 percent were belonged to medium education category.

Kumbar (1983) conducted a study in Bijapur district of Karnataka State on grape growers, and observed that 63.46 percent of the respondents were belonged to low education category and 36.54 percent of them belonged to high education category.

Hegde (1986) in his study indicated that 54.16 percent of the cardamom growers were functionally literate and 45.84 percent were functionally illiterate. This study was conducted in Uttar Kannada-district of Karnataka State.

Kothekar (1987) conducted a study in Panchayat Samiti Kalmeshwar (Maharashtra State), reported that only few orange growers were illiterate (5%). The educated orange growers were found in all the categories. The orange growers were almost educated.

Marilingannavar and Manjunath (1992) conducted a study in Ranebennur taluk of Dharwad district, reported that majority of the respondents (76.00%) were found to be illiterate. Whereas 17.33 percent of them had education upto primary school and 5.33 percent of them could read and write only, nearly equal percentage (0.67%) of them had education upto highschool and college level.

From the above studies, it could be inferred that more number of farmers had studied upto primary and middle school.

2.6.3LAND HOLDING:

Thimmappa (1981) conducted a study in Tumkur district of Karnataka State, and the observed that 65 percent of coconut growers were having small land holdings and 35 percent having large holdings.

Khandagode (1982) conducted a study on citrus growers in Nagpur district of Maharashtra State, and reported that more than half of the orange growers (53 percent) had 6 to 10 acres of land, 35 percent farmers had land between 11 to 15

acres while eight percent and four percent farmers possessed more than 16 acres of land and less than 5 acres of land, respectively.

Reddy (1983) conducted a study in Tungabhadra Project area in Karnataka State, and found that 44.34 percent of banana growers were having low land holdings, 29.33 percent of farmers were having medium land holdings and 27.33 percent were having high land holdings.

Kumbar (1983) conducted a study in Bijapur district of Karnataka State and he revealed that 51.70 percent of grape growers were belonged to low land holding category and 48.30 percent were having large land holdings.

Hegade (1986) conducted a study on cardamom growers in Uttar Kannada district of Karnataka State, and reported that majority (63.33%) of cardamom growers were having small holdings and 36.67 percent of farmers were having large holdings.

Kothekar (1987) conducted a study in Panchayat Samiti, Kalmeshwar (Maharashtra State) and he revealed that equally more number of orange growers possessed 4 hectares and less than 4 hectares of land. The average holdings of rest of the orange growers comes to about 9 hectares.

Naik (1993) in his study conducted in Dharawad district of Karnataka State observed that, 40.00 percent of the respondents had big land holdings followed by small land holders (30.00%) and marginal land holders (26.00%).

Hanumanaikar (1995) conducted a study in Ranebennur taluk of Dharawad district on sunflower growers and observed that big land holders category occupied the highest percentage (70.00%) followed by land holding of small (30.00%).

From the above reviews, it could be inferred that farmers had different size of holdings.

2.6.4 Annual Income

Narasimha (1980) conducted a study on trained farmers of Malaprabha command area in Karnataka State and found that 68.00 percent of trained farmers had law income level.

Khandagode (1982) conducted a study on citrus growers in Nagpur district of Maharashtra State, and revealed that the annual income of more than four-fifth (81%) citrus growers was between Rs.6000 and Rs.10,000 and 14 percent farmers had income upto Rs.5000. Four percent and one percent farmers had income in between Rs.11,000 to 15,000 and Rs.16,000 and above respectively.

Kumbar (1983) conducted a study in Bijapur district of Karnataka State on grape growers, and observed that majority (63.26%) of the grape growers had high level of income and 36.74 percent respondents were in the low level of annual income group. The minimum annual income was Rs.15,000 and maximum of Rs.75,000.

Hegde (1986) conducted a study on cardamom growers of Uttar Kannada district of Karnataka State, and revealed that majority (68.33%) of cardamom growers were having upto Rs.58,190 annual income and 31.67 percent with more than Rs.58,190 annual income.

Purushotham *et al.* (1988) conducted a study in Coimbatore of Tamil Nadu State and found that 62.00 percent of the respondents belonged to low income group, 24.00 percent to middle income group and 14.00 percent to high income group respectively.

Kadam (1991) conducted a study in Yawal block of Jalgaon district of Maharashtra State and reported that annual income of about three fourth of the contact farmers were below Rs.11,500.

Hanumanaikar (1995) conducted a study in Ranebennur taluk of Dharawad district and reported that more than half of the respondents (73.00%) had income above Rs.11,500 per annum.

Social Participation

Narasimha (1980) conducted a study on trained farmers of Malaprabha command area in Karnataka State and found that 59.00 percent of them had low social participation.

Umamahesh (1985) conducted a study in selected talukas of Dharawad district and reported that 42.00 percent of farmers had medium level of social participation and 29.00, 28.00 percent had low and high level of social participation, respectively.

Hanumanaikar (1995) conducted a study in Ranebennur taluk of Dharawad district, Karnataka, on sunflower growers and he found that only 5.34 percent of the

respondents were members of gram Panchayat. Sixteen percent of the respondents were members of farmer's association and 0.53 percent were office bearers. Thirteen percent of them were members of youth club and one percent were office bearers.

From the above studies, it could be concluded that majority of the respondents had low level of social participation.

Extension contact

Maligi (1985) reported in his study that 40.00, 33.00 and 27.00 percent of soybean cultivators in Kalaghatagi taluk of Dharwad district, belonged to high, medium and low extension contact group, respectively.

Naik (1993) conducted a study in Dharwad district of Karnataka State and reported that majority of the respondents (97.00%) had high level of contact with extension agencies.

Hanumanaikar (1995) conducted a study in Ranebennur taluk of Dharwad district, Karnataka, reported that 79.50 percent of the respondents contacted one or more extension agent like Agricultural Assistant, Assistant Agricultural Officer, subject matter specialists, extension guide etc.

From the above reviews, inferred that majority of the respondent farmers contacts personnel of extension agencies.

2.7 Association between selected independent Variables with knowledge

Variables, Author and Year	Place of Study	Respondent	Dependent Variable	Nature of association
Age:				
Aski (1989)	Belgaum district of Karnataka	Sugarcane growers	Knowledge about sugarcane cultivation practice.	Negative and significant
Kulkarni et al.(1990)	Nanded district of Maharashtra	Farm women	Knowledge about improved agricultural practices.	Non-significant
Nimje et al.(1991)	Washim taluk of Akola district in Maharashtra	Ber cultivating farmers	Knowledge and skills about ber cultivation	Non-significant
Patel et al.(1994)	Seshore district of	Sugarcane	Knowledge about sugar practices	Non-significant
Sadaquath et al.(1994)	Gudnapur Village of Sirsi taluk in North Canara district of Karnataka	Farmers	Knowledge level about farm forestry	Non-significant
Education:				
Aski (1989)	Belgaum district of Karnataka	Sugarcane growers	Knowledge about sugar cane cultivation practice	Positive and significant
Sakharkar et al.(1992)	Umrer Panchayat Samiti of Nagapur district of Maharashtra	Soybean growers	Knowledge about soybean cultivation practice	Positive and significant
Jagadale and Nimbalkar (1993)	Kalmala Tahsil of Solapur district Maharashtra	Dryland rabi Jowar growers	Knowledge about recommended dryfarming technology of rabi Jowar	Positive and significant
Pande and Venkaria (1994)	Surat district of Gujarat State	Banan growers	Knowledge about banana cultivation practice	Positive and significant
Sadaquath et al. (1994)	Gudnapur Village of Sirsi taluk of North Canara district of Karnataka	Farmers	Knowledge level about farm-forestry	Positive

Land holding Mehta et al.(1989)	Dapoli taluk of Ratnagiri district of Maharashtra	Rice and Mango growers	Knowledge about rice and mango cultivation practice	Not associated
Kulkarni et al. (1990)	Nanded district of Maharashtra state	Farm women	Knowledge about improved agricultural practice	Non-significan
Angadi et al. (1992)	Dharwad district of Karnataka State	Groundnut growers	Awareness and knowledge about groundnut cultivation	Non-significan
Pande and Venkaria (1994)	Surat district of Gujarat State	Banana growers	Knowledge about banana cultivation	Positively signigicant
Annual income Mehta et al. (1989)	Dapoli of Ratnagiri district (Maharashtra)	Rice and mango grower	Knowledge about rice and mango cultivation practices.	Significant
Jagadale (1989)	Belgaum district of Karnataka	Cabbage growers	Knowledge about cabbage cultivation practice	Non-significa
Badiger et al.(1991)	Kalkeri village of Dharwad district	Farm women	Knowledge and participation of farm women in forestry	Non-significa
Hanumanaikar (1995)	Dharwad district of Karnataka State	Sunflower growers	Knowledge about sunflower cultivation practice	Positive and significant

2.8 Problems experienced by the respondents while adopting agro-forestry practices

Krishnamoorthy (1990) conducted a study in Mettupalayam taluk of Coimbatore district (Tamil Nadu), and he reported that the constraints faced by farmers to take up agro-forestry were due to long gestation period, root effects on other crops and on underground water, inadequate size of farm, lack of protection, lack of awareness and lack of co-operation from other farmers.

Tewari *et al.* (1990) reported that the success of agro-forestry was limited due to shortage of inputs and financial resources among the Himalayan farmers.

Umale *et al.* (1991) conducted a study in Akola district of Maharashtra State and reported that the important difficulties faced by more than one-third of the farmers (37.50%) was the incomplete knowledge of recommended practices of agro-forestry. Nearly about one-tenth of the farmers stated that the difficulties in use of recommended technologies were uncertainty of market and no provision of subsidy. Very few of the respondents also experienced the difficulties such as non-availability of seedlings intime, lack of irrigation facilities, stunted growth of trees and uncertainty regarding the permission to cut the trees.

Nimje *et al.* (1992) conducted a study in Washim taluk of Akola district (Maharashtra State), and reported that initial expenditure for adoption of social forestry programme and recovery of this expenditure takes much time. Managing for the expenditure upto receipt of any earnings from plantations under social

forestry programme is major difficulty expressed by 92 percent of cultivators. Eighty percent of farmers experienced that there is a very little response from departmental officers. Information need and guidance for the sale of the social forestry produce are the difficulties expressed by 76 percent and 60 percent farmers, respectively.

Sadaquath *et al.*(1994) conducted a study in Sirsi taluk of North Canara district (Karnataka), and opined that the majority of respondents (77.77%) revealed lack of location specific technology in respect of farm forestry cultivtion practices as an important problem encountered, followed by more initial expenditure on farm forestry cultivation practices (68.88%), for 38.88 percent of the respondent farmers social sanction was a problem in the practice of farm forestry. It was also observed that 35.55 percent of farmers had faced problems of poor response by forestry extension officers in giving proper guidance to the tree growing farmers.

2.9 Suggestions of farmers for better adoption of agro- forestry

Tewari *et al.* (1990) reported that the credit facilities should be extended particularly to small farmers who may wish to adopt a more productive, but expensive agro-forestry technology, in western Himalayan region.

Lanjewar and Shirke (1991) conducted a study in Nagapur district of Maharashtra State and reported that 42.22 percent of respondents suggested, financial assistance was necessary and organisation of demonstration (26.66%), ban on cutting of forests and trees (22.22%), free supply of saplings (13.33%) and promotion of fruit trees (11.11%) for social forestry programme.

Bhople (1992) conducted a case study on ber cultivation in Buldhana district of Maharashtra State, and reported that sizable proportion of the members suggested that technology for control of powdery mildew of ber should be developed and made available. They have also stressed that the subsidiary be made available intime and payable in cash.

METHODOLOGY

III METHODOLOGY

The present study was conducted during the year 1994-95 in Dharwad district of Karnataka State. In this chapter a detailed description of the procedure and methods used in conducting the study is presented under the following sub headings.

3.1 Selection of district.

3.2 Selection of taluk and villages.

3.3 Population of the study.

3.4 Selection of respondents.

3.5 Brief description of the study area.

3.6 Methods used for measurement and quantification of variables.

3.7 Development of interview schedule.

3.8 Statistical tools and tests used.

3.1 Selection of district

The research study was conducted in Dharwad district of Karnataka State. This district was purposively selected, because of higher rainfall as it comes under transitional belt and best suited for growing forest trees.

3.2 Selection of taluk and villages

Hangal taluk, among 17 taluks of Dharwad district was selected purposively in consideration of its potentiality for growing of trees in individual holdings.

There are six AAO's ranges and 26 AA's circles under the jurisdiction of the taluk. For selection of ranges, circles and villages, simple random sampling procedure was followed. Accordingly three ranges, two circles from each range and two village from each circle were selected. Thus, totally 12 village from the taluk were selected for the study.

3.3 Population of the study

All the farm families of selected village of Hangal taluk constituted the population for the study.

3.4 Selection of respondents

A list of farm families was prepared for each of the selected village separately with the help of the respective village accountant. The respondents were selected following proportionate sampling proceedure as against the decided sample of 150. Range, circle and village wise selection of the respondents is as follows.

Ranges	Circles	Villages	No. of farm families	No. of respondents
Tiluvalli	Tiluvalli	Koppagondanakoppa	55	9
		Yettinahalli	50	8
	Gondi	Gondi	90	14
		Makarvalli	160	26
Akkialur	Akkialur	Akkialur	151	24
		Adur	90	14
	Shiragod	Mudur	56	9
		Hirur	47	7

Cont'd....

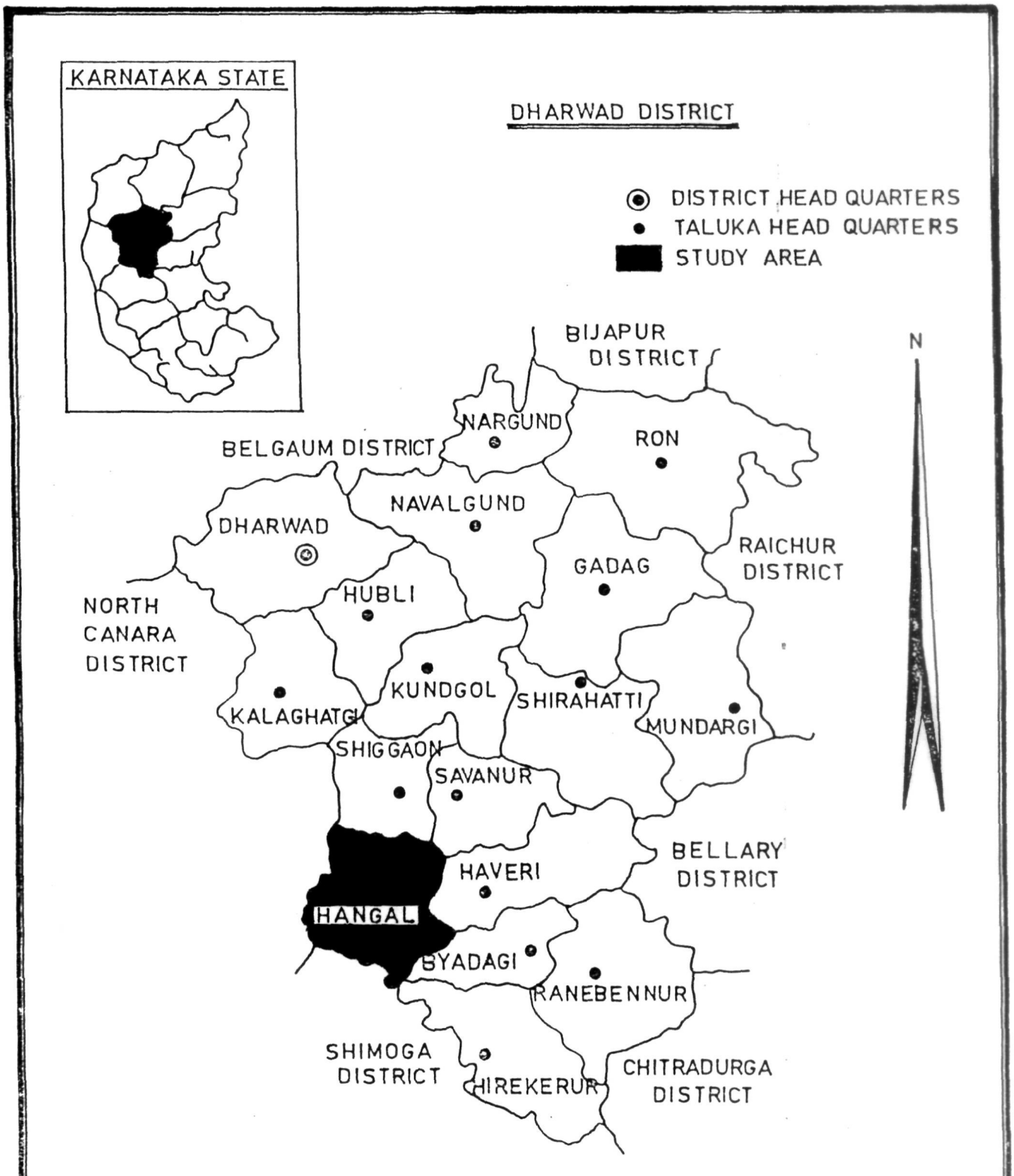
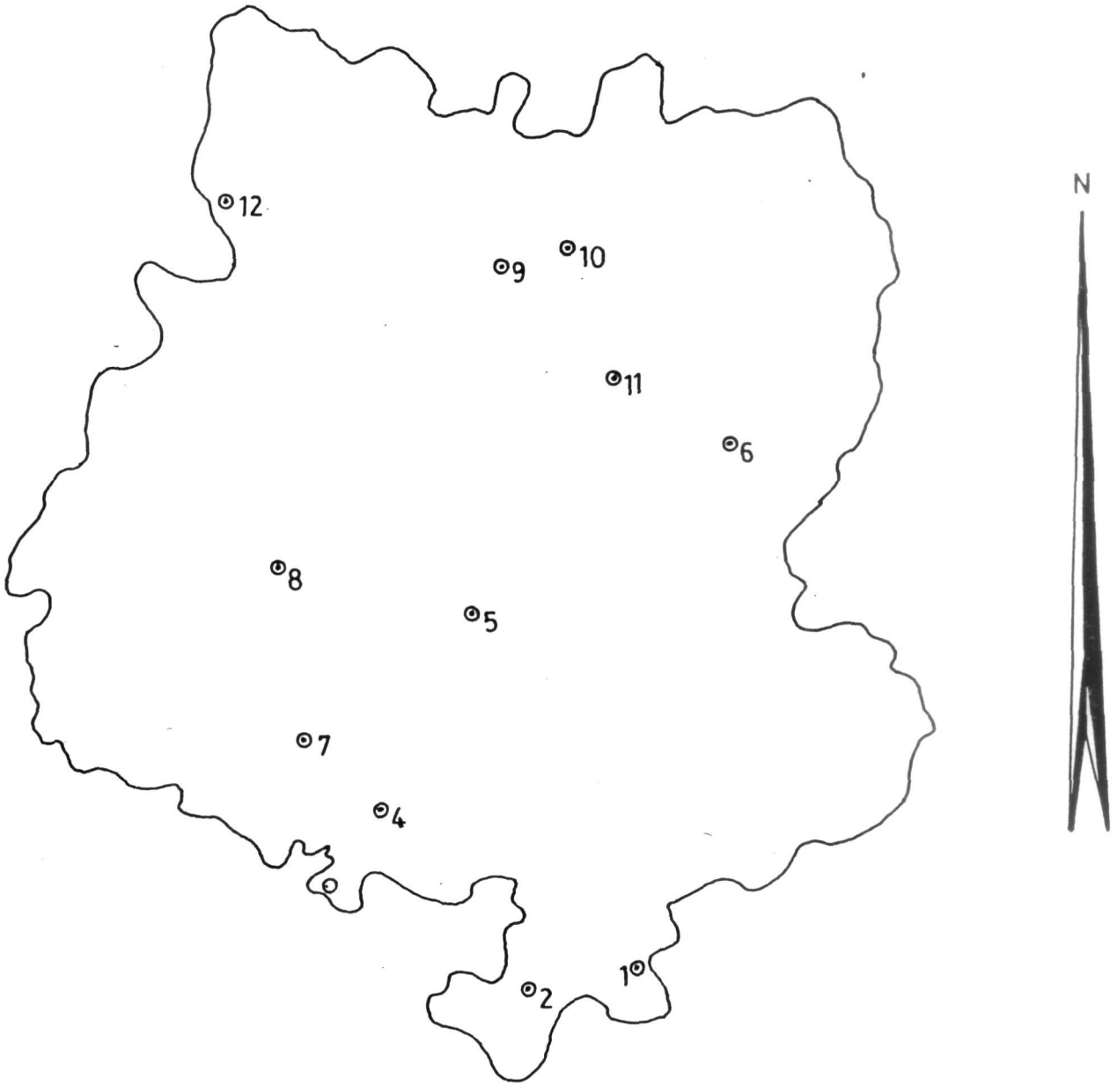


FIG:1-MAP OF DHARWAD DISTRICT SHOWING THE STUDY AREA.

LEGEND

1. KOPPAGONDANAKOPPA
2. YETTINAHALLI
3. GONDI
4. MAKARVALLI
5. AKKIALUR
6. ADUR
7. MUDUR
8. HIRUR
9. BELAGALPETE
10. ALADAKATTI
11. KANCHINEGALUR
12. JAKKANAYAKANAKOPPA



MAP OF HANGAL TALUK DEPICTING THE SELECTED VILLAGES.

Cont'd....

Ranges	Circles	Villages	No.of farm families	No. of respondents
Belagalpete	Belagapete	Belagapete	90	14
		Aladakatti	46	7
	Kanchineglur	Kanchineglur	70	11
		Jakkanayanakoppa	43	7
			Total =	150

3.4 Brief description of the study area

Dharwad district is situated in Northern part of Karnataka State (74°25' Northern latitude and 41°31' eastern longitude), part of Dharwad district comes under Northern transitional zone. The soils of this district are deep to very deep black, sandy loam and are light textured. The total population of the district is 35,03,200 (1991 census) among them 17,07,298 (42.36%) were literate. The total geographical area of the district is 13,78,200 hectares, out of which 10,88,688 hectares is under cultivation. The average rainfall of the district is 800 mm. This district is having 430 Agricultural Assistants circles under 60 ranges of Assistant Agricultural officer. This district is known for its educational dignity. The district has seed testing laboratory, Agricultural University, and many Voluntary Organisations which have dedicated themselves to educate the rural people in all aspects of life including agriculture and forestry.

Forest occupies 8.36 per cent (11,485 ha) of the area in Dharwad district. Department of forest, Dharwad division has undertaken several programmes in the district. Namely town forestry programme, extension forestry programme, watershed based block planting programme, bamboo plantation programme, free distribution of bamboo and poles for schedule castes and schedule tribes programme etc. In addition to this department of forestry, University of Agricultural Sciences, Dharwad, implemented Technology Extension Project on Agro-Forestry

(TEPA) scheme sponsored by Department of Wastelands Development, Ministry of Rural Development, at the total cost of Rs.19.03 lakhs spread over 4 years from 1994-95 and 1997-98. The project involves demonstrating proven agro-forestry models in different agro-climatic zones of Karnataka on a). Community or Panchayat lands - 30 ha, b). University land - 25 ha, and c). Farmers lands - 70 ha.

As a part of this project, every year 20 extension workers (officials) and 100 farmers are trained in agro-forestry technology. Extension workers training are being conducted at Dharwad and farmers trainings at Dharwad, Bijapur and Gangavati to achieve the set target of planting of trees.

Further, Department of Forests, University of Agricultural Sciences, Dharwad, being carried out Diagnostic and Design (D and D) survey to understand the present agro-forestry systems in each of the zones as a part of All India Coordinated Research Project (AICRP) on Agro-Forestry. Every year farmers training programmes on agro-forestry were conducted at Bijapur, Bidar, Raichur, Belgaum and Dharwad district.

State Social Forest Department has its own publicity wing to propogand the activities of planting of trees in public and private lands.

Hangal is among the 17 taluks of Dharwad district, falls under "semi-malnad" track which belongs to hilly zone of Karnataka State. In Hangal, publicity wing, Department of Social Forest, has undertaken several activities. Namely, conducting demonstrations of planting of trees particularly Teak, Eucalyptus and other fruit trees, conducted educational activities to create environmental awareness, Farmers training etc. In addition to this Social Forest Department distributed more than 5 lakh seedlings to the farmers in Hangal Taluk alone. Hence, there is ample scope for adoption of agro-forestry practices.

Basic data of Hangal taluk are as follow :

Sl. No.	Particulars	Hangal taluk data
1.	Geographical area (ha)	77525
2.	Net area shown (ha)	48678
3.	Forest area (ha)	8474
4.	Rainfall (mm)	933.4
5.	Population	204400
6.	Density of Population	264
7.	Literacy levels (%)	39.68
8.	Net irrigated area (ha)	
	(i) From canals	5561
	(ii) Tank	9082
	(iii) Wells	247
	(iv) Borewells	4316
	(v) Other sources	1787
	(vi) Total :	20993

Cont'd.....

Cont'd.....

Sl. No.	Particulars	Hangal taluk data
9.	Banks (in numbers)	
	(i) Commercial banks	8
	(ii) Grameena banks	7
	(iii) Urban co-op. banks	7
	(iv) Primary Land Development Banks	1
	(v) Vyavasay seva sahakari sanghas	20
10.	Land holdings (in numbers)	
	(i) Marginal farmers (less than 1 ha)	7954
	(ii) Small farmers (1 to 2 ha)	10057
	(iii) Semi-medium farmers (2 to 4 ha)	6439
	(iv) Medium farmers	2895
	(v) Large farmers (above 10 ha)	268
	(iv) Total numbers	27613

3.7 Variables and their empirical measurement

The procedure followed to quantify and describe the variables selected for the study is detailed bellow.

Dependent Variables

Knowledge:

In the present study, knowledge referred to the body of information understood and retained by the respondents about recommended agro-forestry practices.

Construction of a teacher made knowledge test:

A teacher made knowledge test was developed to measure the knowledge level of farmers about recommended agro-forestry practices. The test consists of 24 knowledge questions. The questions were provided with multiple choice questions. In certain cases only two possible alternative answers were provided. The answers to the questions were quantified by assigning 1.00, 0.75, 0.5 and 0.25 scores depending upon their relative closeness to the correct answers to that particular question and zero score was assigned for incorrect answers or not known answers. Maximum score that one could get was 24 and minimum was zero, respectively.

The knowledge test questions and answers were carefully framed in consultation with agronomists, forest scientists and extension specialists, mainly considering the package of practice booklet published for the cultivation of forest plants.

Based on the total scores obtained, the respondents were classified into three categories, namely, low, medium and high using mean and standard deviation as a measure of check

Knowledge level	Score
Low	Less than (Mean-1 SD).
Medium	Between (Mean $\pm$ 1 SD).
High	More than (Mean + 1 SD).

Adoption:

In the present study adoption is the acceptance and application of some or all the recommended practices by the respondents. Extent of adoption was determined based on number of farmers adopted the selected agro-forestry practices. The results were expressed in terms of frequency and percentage.

Selection of agro-forestry practices for the study:

The package of practices recommended jointly by the University of Agricultural Sciences Dharwad and Karnataka State Department of Agriculture for cultivation of crops including Agro-forestry practices was considered for the study. The practicability of the recommended practices was further confirmed through discussion with the scientists in the field of agro-forestry and few progressive farmers.

Thus, following 10 practices were finally selected.

- Planting of trees along field borders/on bunds.
- Planting of trees along irrigation canal.
- Planting of trees inrows.

- Establishment of livebunds.
- Planting of trees in less fertile and waste lands.
- Planting of trees along field roads.
- Agri-horti practice.
- Random planting of trees.
- Silvi- pasture practice.
- Block planting of trees.

Perception of usefulness:

In the present study, perception of usefulness referred to the understanding of usefulness of agro-forestry practices by the adopters.

To measure the perception of usefulness of agro-forestry practices, adopters were asked to express their opinion/impression regarding usefulness of the practices which they have adopted. The responses were recorded and presented in terms of frequency and percentage.

Motivational factors and sources influenced to adopt agro-forestry.

In order to assess the motivational factors and sources in taking up agro-forestry practices, the adopters were asked to express the factors and/or sources which motivated them for adoption as agro-forestry practices. The responses thus obtained were expressed in terms of frequency and percentage.

Problems experienced by the adopters while adopting Agro-forestry practices on their farms

To know the constraints/problems experienced in taking-up agro-forestry on their farm, they were asked to indicate the problems experienced by

them. The responses thus obtained were expressed in terms of frequency and percentage.

Suggestion for better adoption of Agro-forestry practices

Suggestions of the respondents for better adoption of the agro-forestry practices were also sought and expressed in frequency and percentage.

Independent variables and their measurements

Age

It refers to chronological age of the respondents at the time of investigation.

The age of the respondents in completed years will be considered for all purpose of analysis. The respondents will be further classified into three groups as follows.

Age	Category
Up to 35 years	Young
36 to 50 years	Middle
50 years and above	Old

Education

It refers to number of years of formal schooling completed by the respondents.

Education of the respondents will be quantified using the procedure followed by Patil (1994) and accordingly one score will be assigned to each year of formal schooling. Further, the respondents were classified into 5 categories as follows.

Category	Education
Illiterate	Do not read and write.
Primary School	1-7th standard
High School	8-10th standard
College	P U C and above
Graduate	Any degree.

Land holding

It refers to the number of acres of land owned by an individual farmers.

The conversion procedure as specified by Mysore State Land Reforms Act No. 38 of 1966 of equating 3 acres of dryland to an acre of irrigated land will be followed to arrive at the extent of total land owned. A score of one was given for each standard acre of land owned. Depending upon the farm size, the respondents are grouped into four categories using the criterion adopted by the small Farmers Development Agency, Bangalore district (1971). The criteria is as follows.

Category	Land holding
Marginal farmers	Upto 2.5 acres
Small farmers	2.5 to 5 acres
Medium farmers	5 to 10 acres
Big farmers	Above 10 acres

Annual income

It refers to total income earned by the respondent farmer both from agriculture and allied enterprises in one year as expressed by the respondents in rupees. A score of one was given for Rs.1000. Further the respondents were categorised into two categories as per the classification suggested by the Department of Revenue, Government of Karnataka (1991) as indicated below.

Category	Income
I	Upto Rs.11,500.
II	Above Rs.11,500.

Social participation

It refers to the degree of involvement of individuals in the formal social village organisations as a members and/or office bearer.

Social organisations considered:

Gram panchayat

Co-operative Society

Yuvak Mandals

Farmers Association.

Degree of Participation

Regular : Participated whenever conducted.

Occasional: Participated in some of the meetings/ activities.

Never : Not participated in any of the meetings or activities.

The responses were expressed in frequency and percentage.

Extension Contact

It refers to the extent of contacts of farmers with different extension agencies.

Extension agencies considered:

Agricultural Assistant

Assist. Agriculture Officer

Subject Matter specialists.

Assist. Director of Agriculture

Range Forest Officer

Forest Motivator.

To study the awareness of respondents about extension agencies, they were asked to indicate the extension agencies who knows for them. The obtained responses were expressed in frequency and percentages.

Mass Media utilisation

It refers to the exposure of the respondents to different mass communication media such as radio, Television, Newspapers, Farm magazines. Further, the respondents were asked to indicate the frequency of utilisation of different programmes of television, radio. The responses were expressed in frequency and percentage.

3.8 Development of interview schedule

Keeping in view the objectives of the study, an interview schedule was developed. The schedule was pre tested in non-sample area to test its relevance and practicability. Based on the experience gained during pre-test, the interview schedule was modified wherever needed. The final schedule was used to elicit the information from the respondents by personal interview method.

3.9 Statistical tools and tests used

The data thus collected for the purpose of the study were quantified, categorised and tabulated. Statistical techniques such as percentage, mean and standard deviation were employed to draw valid conclusions.

To know the association between selected personal and socio-economic characteristics of the respondents with their knowledge level the product-movement correlation co-efficient and multiple regression analysis were used.

RESULTS

IV RESULTS

The result of the investigation are presented under the following headings.

4.1 Respondent's knowledge of the Agroforestry practices

4.2 Adoption of individual Agro-forestry practices by the respondents

4.3 Perception of usefulness about individual Agro-forestry practices by the adopters

4.4 Motivational factors influenced to adopt of Agro-forestry practices

4.5 Personal and socio-economic characteristics of the respondents and its association with knowledge

4.6 Problems experienced by the adopters while adopting Agro-forestry practices

4.7 Suggestions of the respondents for better adoption of Agro-forestry practices

4.1 RESPONDENT'S KNOWLEDGE OF AGRO-FORESTRY PRACTICES

Knowledge is the body of understood information. Usually respondents vary in their knowledge level. The findings related to respondent's knowledge of the Agro-forestry practices are presented in Table-1, Fig-1.

Sixty nine per cent of the respondents had medium level of knowledge of Agro-forestry practices. The mean knowledge score of this category was 12.37. While 19.00 and 12.00 per cent of them had low and high level of knowledge with mean knowledge score 4.95 and 17.98, respectively. The overall mean knowledge score of the respondents was 11.64.

Table 1. Respondents' knowledge of Agro-forestry practices

Knowledge categories	Respondent		
	Frequency	Percentage	Mean knowledge score
Low ($\bar{X}$ - SD)	28	19.00	4.95
Medium ($\bar{X}$ ± SD)	103	69.00	12.37
High ($\bar{X}$ + SD)	19	12.00	17.98

$\bar{X}$ = 11.64

SD = 4.32

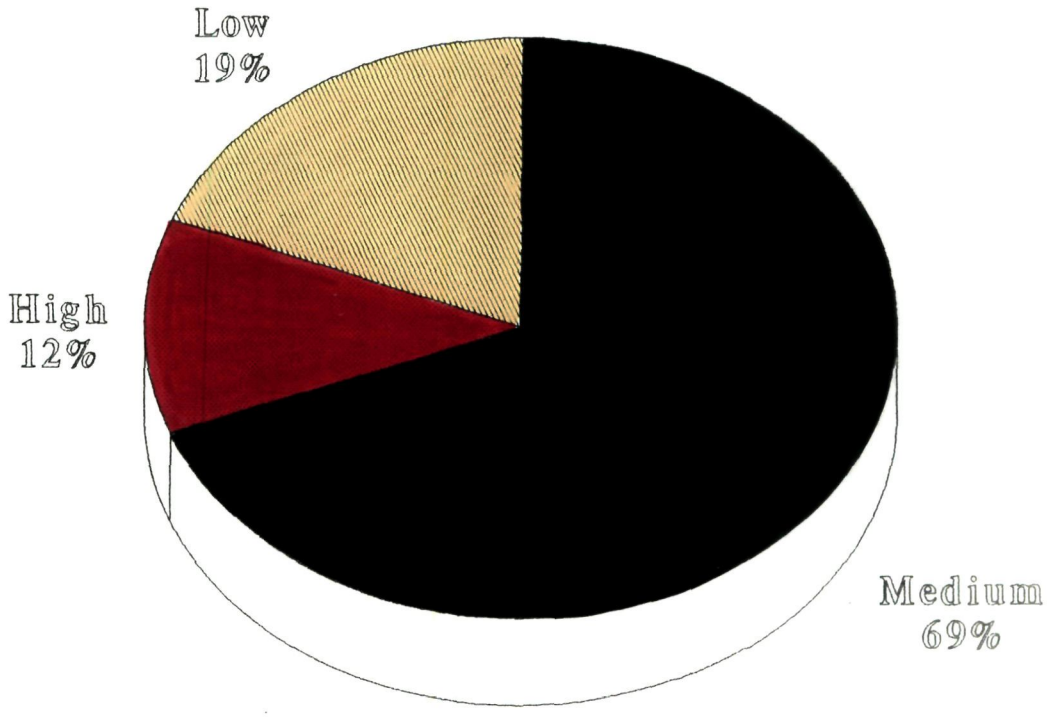


Fig 1. Respondents' knowledge of Agro-forestry practices

4.2 ADOPTION PATTERN OF INDIVIDUAL AGRO-FORESTRY PRACTICES BY THE RESPONDENTS

The results presented in the Table-2, Fig-2 revealed that majority of the respondents had adopted the practice, planting of trees along field borders/on bunds (50.66%) followed by planting of trees along irrigation canal practice (16.00%) and rest of the practices were followed by lesser per centage of the respondents.

4.2.1 Adoption of Agro-forestry practices by different categories of farmers

It was observed from the Table-3, Fig-3 that, the practice of planting of trees along field borders/on bunds was adopted by 45.00, 37.00, 16.00 and 2.00 per cent of formers belonging to medium, big, small and marginal categories, respectively.

The practice, planting of trees along irrigation canal was adopted by 54.00, 42.00 and 4.00 per cent of big, medium and marginal category farmers, respectively.

It was noticed the adopted of the practice, establishment of livebunds was in the order of 55.00, 28.00 and 17.00 per cent of big, medium and small farmers category, respectively. While, 59.00, 29.00 and 12.00 per cent of big. medium and small farmers had adopted the practice, planting of trees in rows.

Planting of trees in less fertile and waste lands practice was adopted by 75.00, 19.00 and 6.00 per cent of big, medium and small category of farmers, respectively.

LEGEND

P_1 = Planting of trees along field borders/on bunds

P_2 = Planting of trees along irrigation canal

P_3 = Establishment of livebunds

P_4 = Planting of trees in rows

P_5 = Planting of trees in less fertile and waste lands

P_6 = Block planting of trees

P_7 = Agri-horti practice

P_8 = Planting of trees along field roads

P_9 = Random planting of trees

P_{10} = Silvi-pasture practice

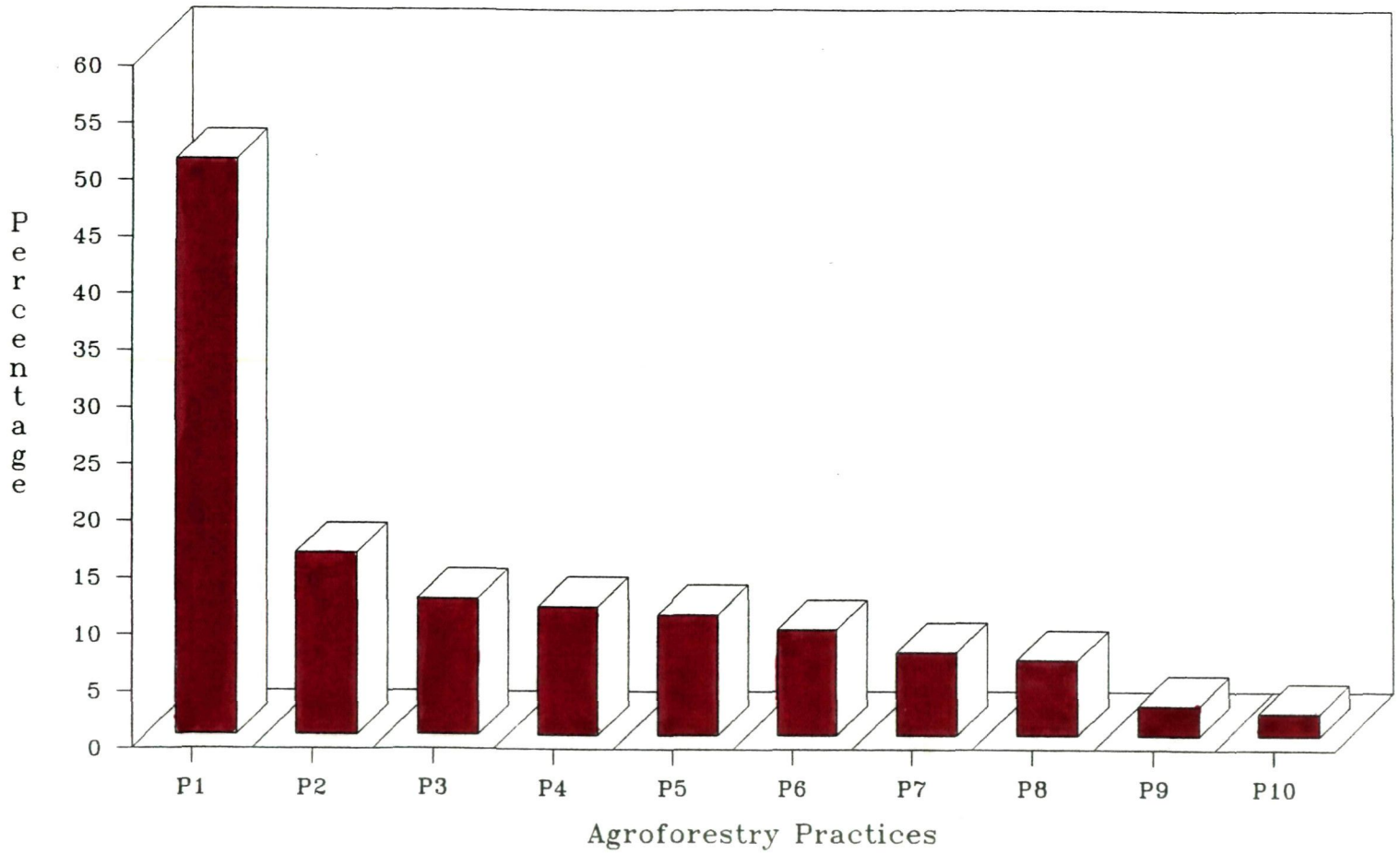


Fig.2 Adoption pattern of Agro-forestry practice by the respondents

Table 2. Adoption pattern of Agro-forestry practice by the Respodents

n = 150

Agroforestry Practice	Respondents	
	No	Percentage
Planting of trees along field borders /on bunds	76	50.66
Planting of trees along irrgation canal	24	16.00
Establishment of live bunds	18	12.00
Planting of trees in rows	17	11.33
Planting of trees in less fertile and waste land	16	10.66
Block planting of trees	14	9.33
Agri-horti practice	11	7.33
Planting of trees along field roads	10	6.66
Random planting of trees	4	2.66
Silvi-pasture practice	3	2.00

Note: Multiple response obtained.

Table 3. Adoption of Agro-forestry practices by different categories of farmers

Agro-forestry Practices	Farmers' categories							
	Marginal		Small		Medium		Big	
	No	%	No	%	No	%	No	%
Planting of trees along field borders /on bunds (n=76)	2	2.00	12	16.00	34	45.00	28	37.00
Planting of trees along irrgation canal (n=24)	1	4.00	-	-	10	42.00	13	54.00
Establishment of live bunds (n=18)	-	-	3	17.00	5	28.00	10	55.00
Planting of trees in rows (n=17)	-	-	2	12.00	5	29.00	10	59.00
Planting of trees in less fertile and waste land (n=16)	-	-	1	6.00	3	19.00	12	75.00
Block planting of trees (n=14)	-	-	5	36.00	2	14.00	7	50.00
Agri-horti practise (n=11)	-	-	-	-	2	18.00	9	82.00
Planting of trees along field roads (n=10)	-	-	1	10.00	2	20.00	7	70.00
Random planting of trees (n=4)	-	-	-	-	3	75.00	1	25.00
Silvi-pasture practice (n=3)	-	-	-	-	3	100.00	-	-

The practice, block planting of trees was adopted by 50.00, 36.00 and 14.00 per cent of big, small and medium category farmers, respectively. Agri-horti practice was adopted by 82.00 and 18.00 per cent of big and medium category farmers. The farmers belonging to remaining category had not adopted the practice.

Adoption of planting of trees along field roads was in the orders of 70.00, 20.00 and 10.00 per cent by big, medium and small farmers, respectively. While 75.00 and 25.00 per cent of medium and big farmers, respectively adopted random planting of trees practices.

Silvi-pasture practice i.e. combination of forest trees and pasture crops on the same unit of land was adopted only by medium farmers but the extent of 100 per cent.

4.2.2 Trees species planted by the respondents in individual Agro-forestry practices

Tree species like Neem, Mango, Coconut, Teak, Eucalyptus, Tamarind and Acacia were planted by 37, 24, 22, 16, 12, 9 and 5.00 per cent of the respondents planted along the field borders/on bunds. while Tamarind, Mango, and Papaya trees were planted by 62.00, 50.00 and 13.00 per cent of the respondents along the irrigation canal. It was presented in Table-4, Fig-3a and 3b.

Establishment of livebunds practice included planting of subabul, susbenia + Khusgrass, local grasses and susbenia trees/grasses by 50.0, 39.00, 22.00 and 17.00 per cent of the respondents. Coconut, Arecanut, Mango and Banana trees were

Table 4. Tree species planted by the respondents in individual Agro-forestry practices

n=150

Agro-forestry practices	Respondents	
	Number	%
1. Planting of trees along field borders/on bunds (n=76)		
a. Neem	28	37.00
b. Mango	18	24.00
c. Teak	12	16.00
d. Eucalyptus	9	12.00
e. Coconut	17	22.00
f. Tamerind	7	9.00
g. Acacia	4	5.00
2. Planting of trees along irrigation canal (n=24)		
a. Tamerind	15	62.00
b. Mango	12	50.00
c. Papaya	3	13.00
3. Establishment of live bunds (n=18)		
a. Subabul	9	50.00
b. Susbenia + Khusgrass	7	39.00
c. Local grasses	4	22.00
d. Susbenia	3	17.00
4. Planting of trees in rows (n=17)		
a. Coconut	6	35.00
b. Arecanut	6	35.00
c. Mango	4	24.00
d. Banana	1	6.00
5. Planting of trees in less fertile and waste lands (n=16)		
a. Eucalyptus	7	44.00
b. Neem	8	50.00
c. Acacia	4	25.00
d. Mango	3	19.00
e. Ber	3	19.00

Contd....

Contd...

Agro-forestry practices	Respondents	
	Number	%
6. Block planting of trees (n=14)		
a. Neem	6	43.00
b. Eucalyptus + Neem	4	29.00
c. Mango	3	21.00
d. Arecanut + Coconut	2	14.00
e. Neem + Mango + Acacia	2	14.00
f. Tamerind + Mango + Neem	1	7.00
7. Agri-horti. practice (n=11)		
a. Bengalgram + Coconut	4	36.00
b. Paddy + Coconut	2	18.00
c. Paddy + Ber	1	9.00
d. Groundnut + Papaya	1	9.00
e. Groundnut + Coconut	1	9.00
8. Planting of trees along field roads (n=10)		
a. Neem	4	40.00
b. Raintree	2	20.00
c. Tamerind	1	10.00
d. Acacia	1	10.00
9. Random planting of trees (n=4)		
a. Tamerind	2	50.00
b. Coconut	2	50.00
10. Silvi-pasture practice (n=3)		
a. Neem + Khusgrass	2	67.00
b. Susbenia	1	33.00

Note : Multiple response obtained

LEGEND (3a)

1	=	Neem
2	=	Mango
3	=	Teak
4	=	Eucalyptus
5	=	Coconut
6	=	Tamarind
7	=	Acacia

LEGEND (3b)

A	=	Tamarind
B	=	Mango
C	=	Papaya

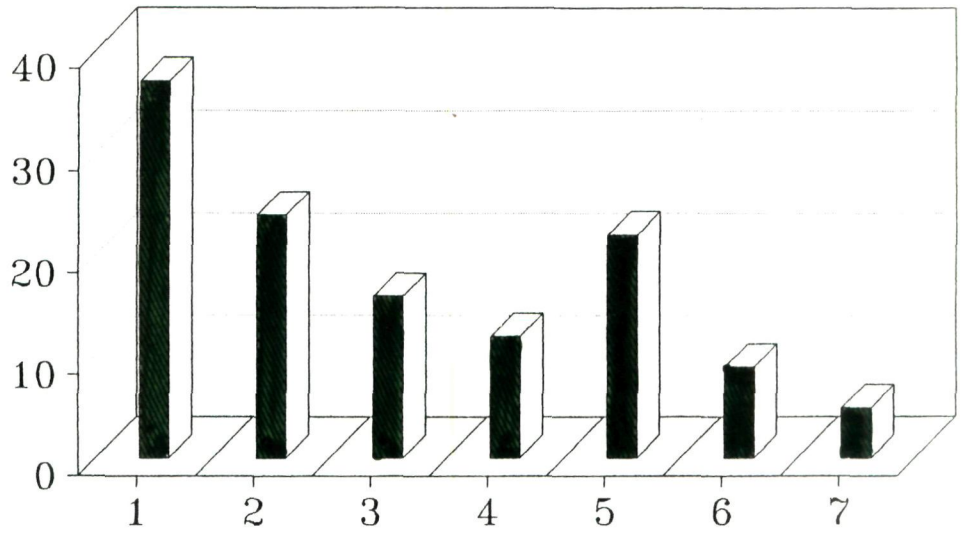


Fig. 3a. Trees speices planted by the respondents in planting of trees along field borders/on bunds

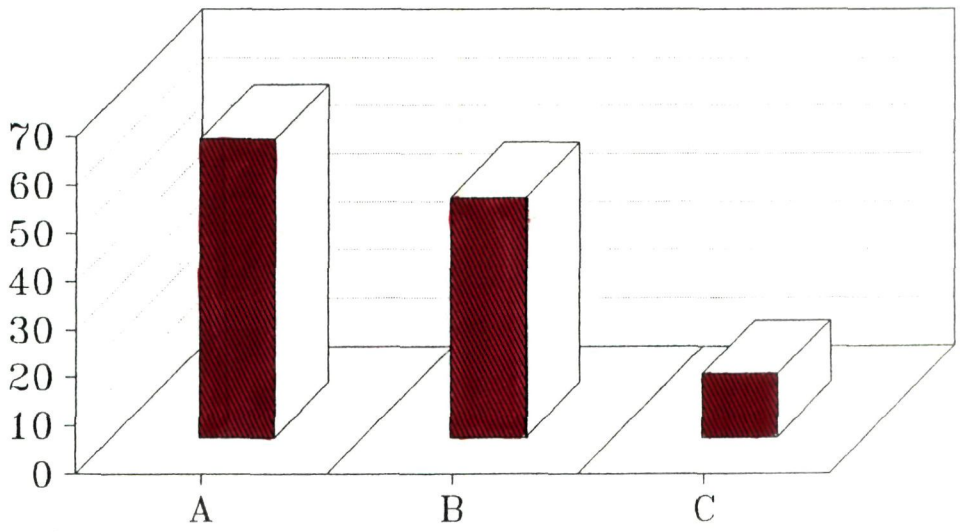


Fig 3b. Trees speices planted by the respondents in planting of trees alor irrigation canal

planted by 35.00, 35.00, 24.00 and 6.00 per cent of the respondents planted trees inrows. Whereas, Eucalyptus, Neem, Acacia, Mango and Ber (each) trees were planted by the respondents in less fertile and waste lands in the order of 44.00, 50.00, 25.00, 19.00 and 19.00 per cent, respectively

In block planting of trees practice, Neem, Eucalyptus + Neem, Mango, Arecanut + Coconut, Neem + Mango + Acacia and Tamarind + Mango + Neem tree species were planted by 43.00, 29.00, 21.00, 14.00, 14.00 and 7.00 per cent of the respondents, respectively.

In Agri-horti practice, farmers had planted the combination of trees viz. Bengal gram +Coconut, Paddy + Coconut, Paddy + Ber, Groundnut + Papaya and Groundnut + Coconut in the order of 36.00, 18.00, 9.00, 9.00 and 9.00 per cent, respectively. Planting of trees along field roads practice was made using 40.00, 20.00, 10.00 and 10.00 per cent of farmers to plant Neem, Raintree, Tamarind and Acacia, respectively.

Tamarind and Coconut plants were planted by 50.00 each per cent of farmers under random planting method. In the silvi-pasture practice, Neem + Khusgrass and susbenia were planted by 67.00 and 33.00 per cent of the respondents, respectively.

4.3 PERCEPTION OF USEFULNESS OF INDIVIDUAL AGRO-FORESTRY PRACTICES BY THE ADOPTERS

It was observed from the table-5 that, among the adopters of planting of trees along field borders/on bunds practice, 42.00, 46.00, 7.00 and 5.00 per cent of them

Table 5. Perception of usefulness of individual Agro-forestry practices by the adopters

n = 150

Agro-forestry practices	Respondents	
	Number	%
1. Planting of trees along field borders/on bunds (n=76)		
a. Provides timber, fuel, fodder, fruits etc.	35	46.00
b. Reduces erosion of bunds	32	42.00
c. Helps in proper utilization of land	5	7.00
d. Prevents heavy winds	4	5.00
2. Planting of trees along irrigation canal (n=24)		
a. Reduces erosion of irrigation canal	15	63.00
b. Provides economic profit	9	37.00
3. Establishment of live bunds (n=18)		
a. Reduces soil erosion	11	61.00
b. Helps for water conservation	4	22.00
c. Provides fodder for cattles	3	17.00
4. Planting of trees in-rows (n=17)		
a. More economical	5	29.00
b. Do not come in the way of cultural operations	4	24.00
c. Protects agril.crops from heavy winds	4	24.00
d. Increases soil moisture	4	23.00
5. Planting of trees in less fertile and waste lands (n=16)		
a. Improves soil fertility	10	63.00
b. Economic use of less fertile and waste lands	6	37.00
6. Block planting of trees (n=14)		
a. Provides timber, fodder, fuel, fruits etc.	8	57.00
b. Economic profit	6	43.00

Contd...

Contd...

Agro-forestry practices	Respondents	
	Number	%
7. Agri-horti practice (n=11)		
a. More economical	7	64.00
b. Proper utilisation of land	4	36.00
8. Planting of trees along field roads (n=10)		
a. Benefit of shade	8	80.00
b. Provides timber, fodder, fuel etc.	2	20.00
9. Random planting of trees (n=4)		
a. Benefit of shade	2	50.00
b. Provides timber, fodder, fuel etc.	2	50.00
10.Silvi-pasture practice (n=3)		
a. Provides timber, fuel etc.	1	33.50
b. Provides fodder during off season	1	33.50
c. Economic use of less fertile lands	1	33.00

LEGEND

Planting of trees along field borders/on bunds

1 a. Provides timber, fuel, fodder, fruits etc.
1 b. Reduces erosion of bunds
1 c. Helps in proper utilization of land
1 d. Prevents heavy winds

Planting of trees along irrigation canal

2 a. Reduces erosion of irrigation canal
2 b. Provides economic profit

Establishment of live bunds

3 a. Reduces soil erosion
3 b. Helps for water conservation
3 c. Provides fodder for cattles

Planting of trees in-rows

4 a. More economical
4 b. Do not come in the way of cultural operations
4 c. Protects agril. crops from heavy winds
4 d. Increases soil moisture

Planting of trees in less fertile and waste lands

5 a. Improves soil fertility
5 b. Economic use of less fertile and waste lands

Block planting of trees

6 a. Provides timber, fodder, fuel, fruits etc.
6 b. Economic profit

Agri-Horti practice

7 a. More economical
7 b. Proper utilization of land

Planting of trees along field roads

8 a. Benefit of shade
8 b. Provides timber, fodder, fuel etc.

Random planting of trees

9 a. Benefit of shade
9 b. Provides timber, fodder, fuel etc.

Silvi-pasture practice

10 a. Provides timber, fuel etc.
10 b. Provides fodder during off season
10 c. Economic use of less fertile lands

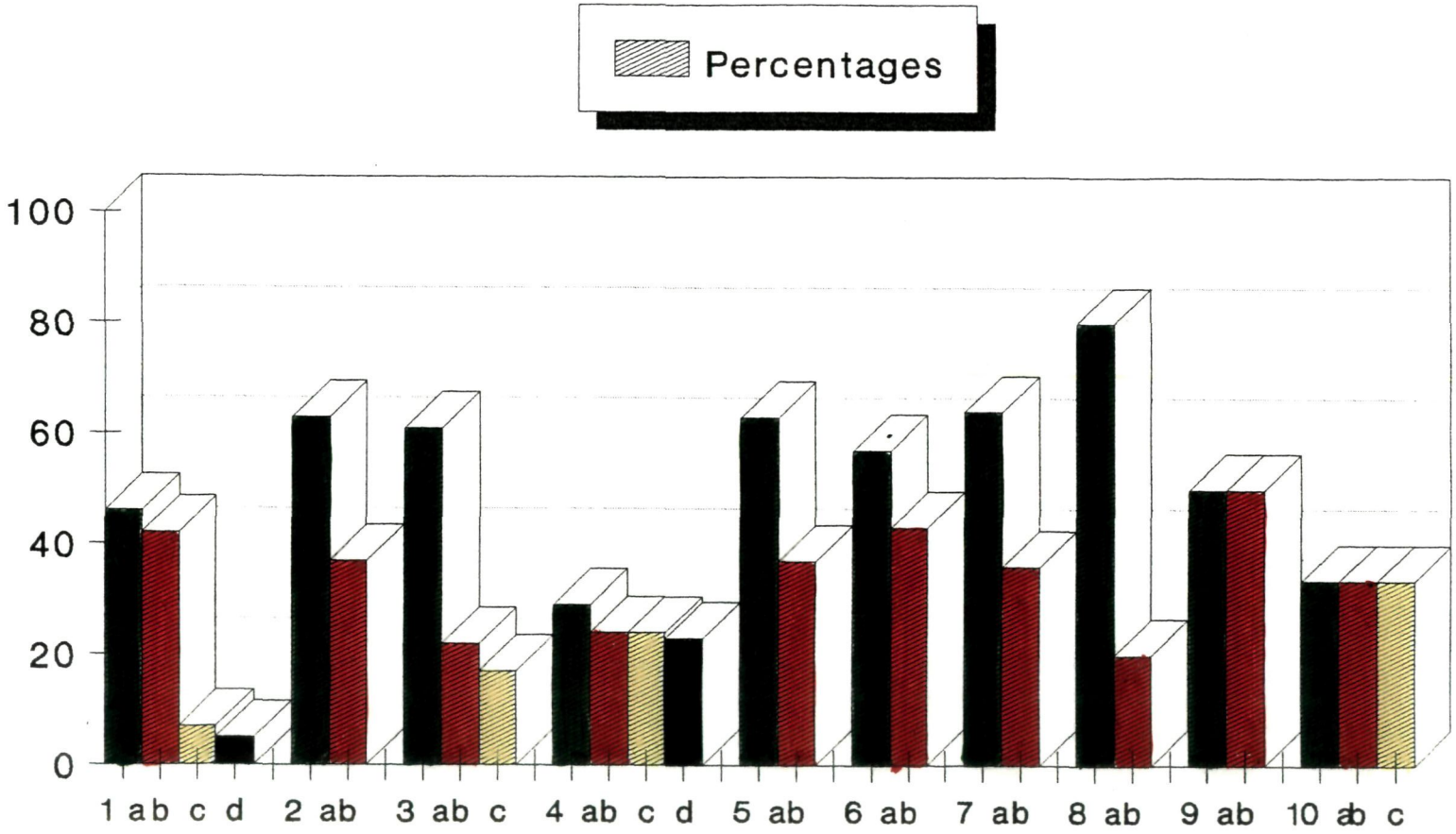


Fig 3c. Perception of usefulness of Agro-forestry practices

perceived that useful it is for providing timbers, fuel, fodder, fruits etc., reducing erosion of bunds, helps in proper utilisation of land and prevents heavy winds, respectively.

About 63.00 and 37.00 per cent of the adopters of planting of trees along irrigation canal practice perceived it usefulness in reducing erosion of irrigation canal, and provides economic profit, respectively.

Establishment of livebunds practice was perceived as useful by 61.00, 22.00 and 17.00 per cent of the adopters for reducing soil erosion, helps for water conservation and provides fodder for cattle, respectively.

The practice, planting of trees in rows were perceived as useful for the reasons, more economical, donot come in the way of cultural operations, protects agril. crops from heavy winds and increases soil moisture by 29.00, 24.00, 24.00 and 23.00 per cent of the respondents, respectively.

With respect to planting of trees in less fertile and waste lands practice, 63.00 and 37.00 per cent of adopters perceived it as useful for the reasons, improves soil fertility and economic use of less fertile and waste lands, respectively.

Fifty seven and 43.00 per cent of adopters perceived block planting of trees as useful for the reasons, provides timber, fodder, fuel, fruits and economic profit, respectively.

Agri-horti practice was perceived as useful by 64.00 and 36.00 per cent of the adopters for the reasons, more economical and proper utilisation of land, respectively.

Planting of trees along field roads practice was perceived useful, because of benefit of shade and provides timber, fodder, fuel etc., by 80.00 and 20.00 per cent of adopter of the same practice.

Random planting of trees was perceived as useful for providing shade and timber fodder, fuel etc. by 50.00 each per cent of the adopters who followed it.

Only three adopters who adopted silvi-pasture practice, each of them felt the practice was useful for the reasons, provides timber, fuel etc. provide fodder during off season and economic use of less fertile lands, respectively.

4.4 MOTIVATIONAL FACTORS INFLUENCED TO ADOPT AGRO-FORESTRY PRACTICES

It was observed from the Table-6, Fig-4 that 57.00, 44.00, 36.00, 17.00, 15.00 and 15.00 per cent of the farmers were motivated to adopt Agro-forestry practices, since they were of the opinion that the practices provides fruits, fodder and fuel, increases aggregate income, improves economic level; controls soil erosion; distribution of seedlings and improves soil fertility, respectively.

4.4.1 Motivational sources for adoption of agro-forestry practices

It was observed from the table-7 and figure-5 that majority of the respondents were self motivated (60.00%) followed by extension officers (44.00%), family members (39.33%), relatives (4.00%) and friends (2.66%), respectively.

LEGEND

M_1 = Provides fruits, fodder, fuel etc.

M_2 = Increases aggregate income

M_3 = Improves economic level

M_4 = Control of soil erosion

M_5 = Distribution of seedlings

M_6 = Improves fertility status of the soil

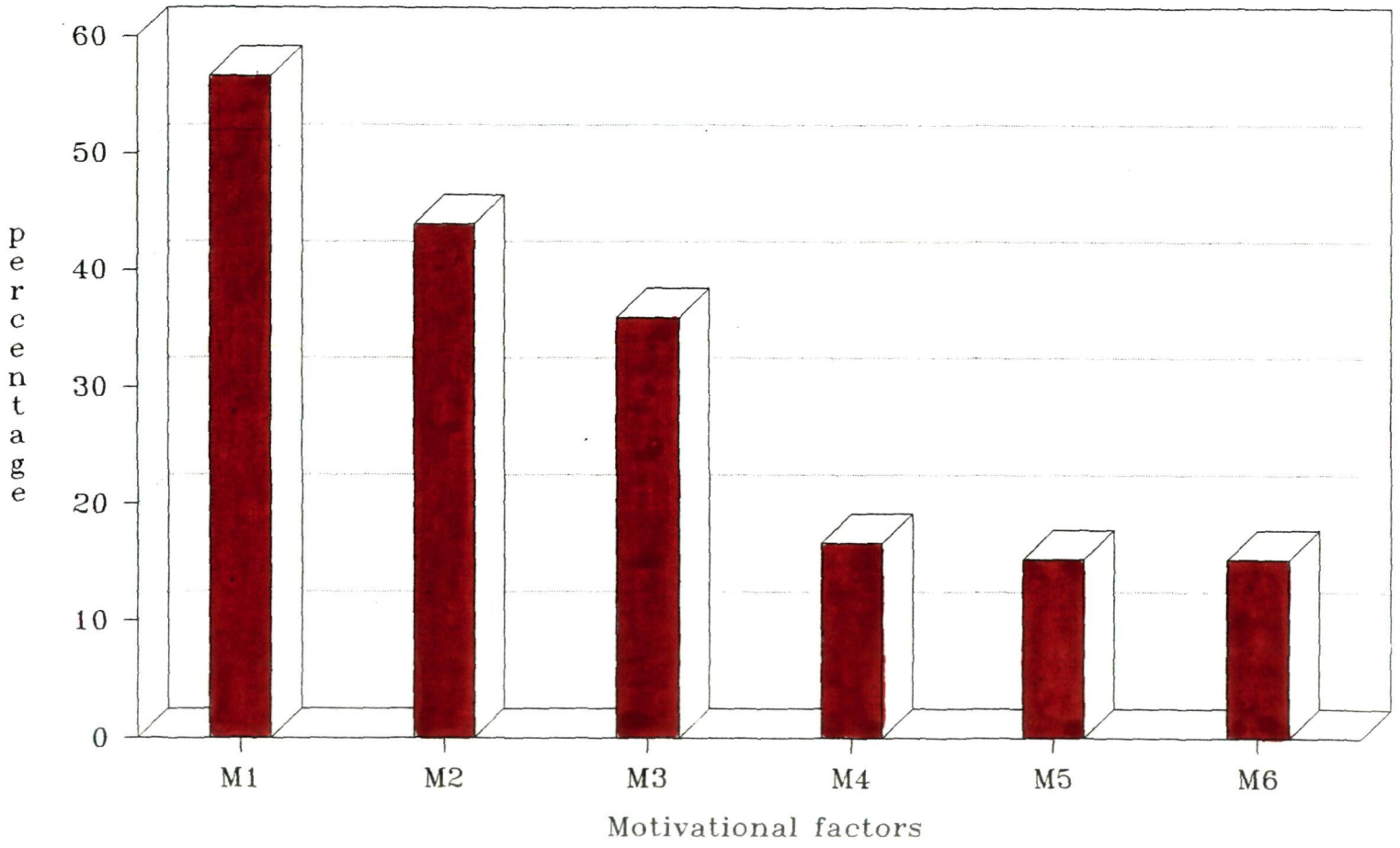


Fig. 4 Motivational factors influenced to adopt agro-forestry practices

Table 6. Motivational factors influenced to adopt Agro-forestry practices

Motivational factors	Respondents	
	Number	%
1. Provides fruits, fodder, fuel etc.	85	56.66
2. Increases aggregate income	66	44.00
3. Improves economic level	54	36.00
4. Control of soil erosion	25	16.66
5. Distribution of seedlings	23	15.33
6. Improves fertility status of the soil	23	15.33

Note : Multiple response obtained.

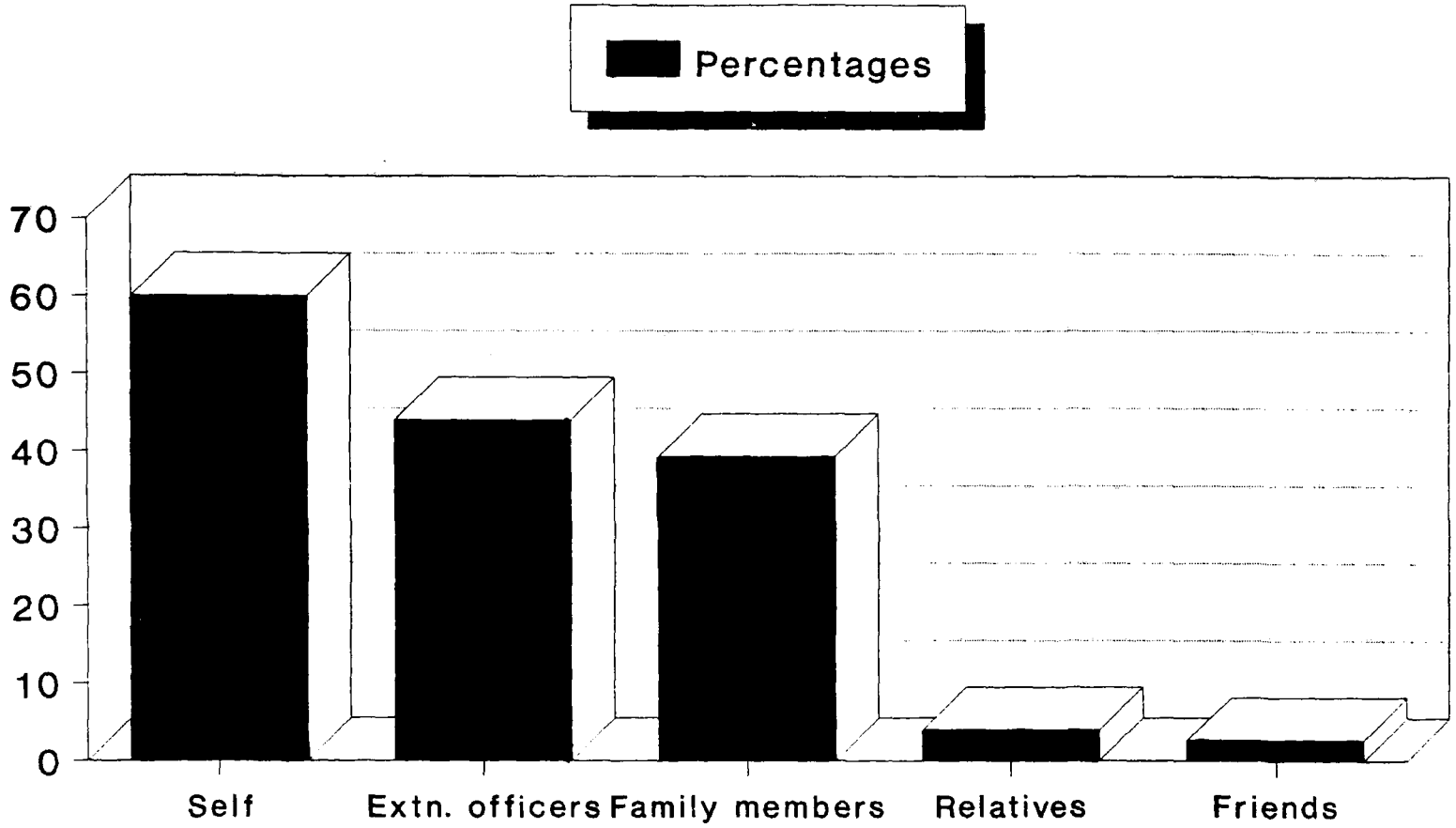


Fig 5. Motivational Sources for adoption of Agro-forestry practices

Table 7. Motivational sources for adoption of Agro-forestry practices

n=150

Motivational sources	Respondents	
	Number	%
Self	90	60.00
Extension officers	66	44.00
Family members	59	39.33
Relatives	6	4.00
Friends	4	2.66

Note : Multiple response obtained.

4.5 PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

Age

The data presented in the table-8 indicated that majority of the respondents belonged to middle age group (49.00%), while 27.00 and 24.00 per cent of them were belonged to young and old age group, respectively.

Education

Fifty six per cent of the respondents had received primary education. While 14.00, 4.00 and 5.00 per cent of them had under gone high school, studied upto PUC and graduation, respectively. But 21.00 per cent of them were illiterate.

Land holding

Forty six, 28.00 and 16.00 per cent of the respondents were medium, big and small farmers, respectively only 10.00 per cent of them were marginal farmers.

Annual income

The economic position of the families of the respondents indicated that 62.00 per cent of them were received an annual income upto Rs.11,500 and rest of them received an annual income of Rs.11,500 and above.

Mass media utilisation by the respondents

Table-9 depicts the mass media utilisation pattern of the respondents.

Radio sets were possessed by majority of the respondents (76.66%). Among them 18.00 per cent of them were regular listener of Krishiranga programme,

Table 8. Personal and socio-economic characteristics of the respondents

n=150

Socio-economic characteristics and category	Respondents	
	Number	%
Age		
Young (Upto 35 years)	41	27.00
Middle (35-50 years)	73	49.00
Old (51 and above)	36	24.00
Education		
Illiterate	31	21.00
Primary school (1-7th std)	84	56.00
High school (8-10th std)	21	14.00
P.U.C.	6	4.00
Degree	8	5.00
Land holding		
Marginal (Upto 2.5 acres)	15	10.00
Small (2.5 - 5 acres)	24	16.00
Medium (5 - 10 acres)	69	46.00
Big (Above 10 acres)	42	28.00
Annual income		
Upto Rs.11,500	93	62.00
Above Rs.11,500	57	38.00

Table 9. Mass media utilisation by the respondents

Mass-media	Possessed/ subscribed		Regular		Occasional		Never	
	Number	%	Number	%	Number	%	Number	%
RADIO	115	76.66			Listening behaviour			
Programmes								
Krishiranga			21	18.00	94	82.00	-	-
News			18	16.00	97	84.00	-	-
Suggestions to farmeres			14	12.00	97	84.00	4	4.00
Songs			12	10.00	73	64.00	30	26.00
Dramas			4	3.00	42	37.00	75	65.00
Children's programme			2	2.00	38	33.00	-	-
TELEVISION	21	14.00			Viewing behaviour			
Programmes								
News			5	24.00	16	76.00	-	-
Krishidarshan			3	14.00	18	86.00	-	-
Songs			4	19.00	17	81.00	-	-
Cinema			5	24.00	12	57.00	4	19.00
Serials			1	5.00	4	19.00	16	76.00
Children's programme			-	-	10	48.00	11	52.00
NEWSPAPER	15	10.00			Reading behaviour			
Samyukta Karnataka	8	53.00	8	100.00	-	-	-	-
Prajavani	6	40.00	6	100.00	-	-	-	-
Manjuwani	1	7.00	1	100.00	-	-	-	-
AGRIL. MAGAZINES	-	-	-	-	-	-	-	-

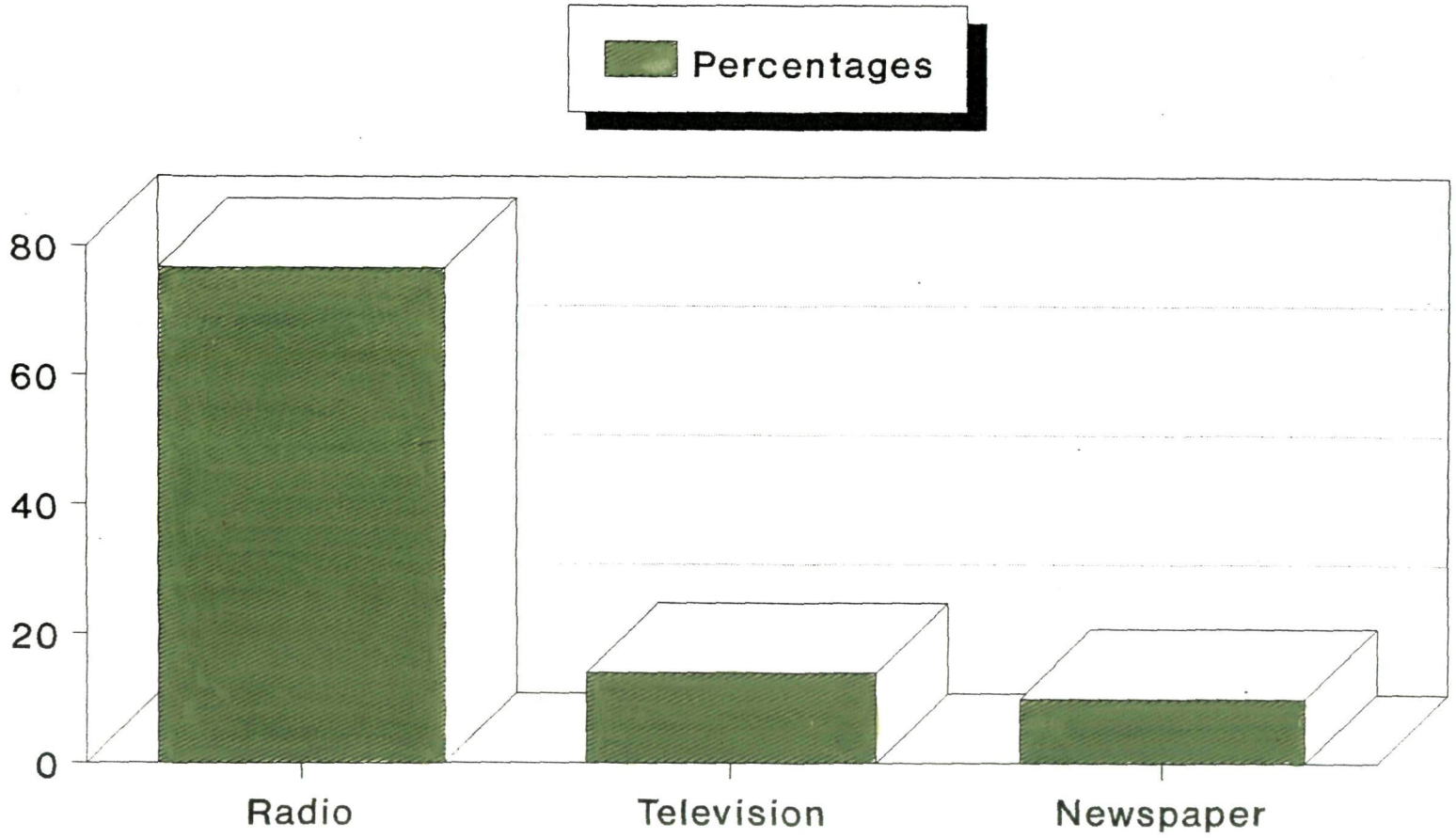


Fig 6. Mass media utilization by the respondents

followed by news (16.00%), suggestions to farmers (12.00%), songs (10.00%), dramas (3.00%) and children programme (2.00%), respectively.

Equal number (84.00%) of them were occasional listeners of news and suggestions to farmers programme, followed by krishiranga (82.00%), songs (64.00%), dramas (37.00%) and children's programme (33.00%).

Television was possessed by 14.00 per cent of the respondents. Twenty four per cent of them were regular viewers of news and serials followed by songs (19.00%), krishidarshan (14.00%) and children's programme (5.00%) Eighty six per cent of them viewed krishidarshan occasionally, followed by songs (81.00%), news (76.00%), cinema (57.00%), children's programmes (48.00%) and serials (19.00%)

Just 10.00 per cent of the respondents were subscribers of news papers. Of them, 53.00, 40.00 and 7.00 per cent were subscribers of Samyukta Karnataka, Prajawani and Manjuvani news papers, respectively. All of them were regular readers of news papers. NOne of them were subscriber to any of the agril. magazines.

Participation in social organisation

It was seen from the table-10 that 53.00 per cent of the respondents were members of one or the other social organisations. Of them, 70.00 per cent as members and 2.00 per cent as office bearers, 18.00 and 9.00 per cent were members of co-operative society, gram panchayat and Yuvak mandal respectively. The members of co-operative society attended meetings regularly and occasionally in the

Table 10. Participation of respondents in social organisation

Membership in one or more organisation	Frequency	%
	79	52.66

Organisations	Membership				Participation					
	Member		Office bearer		Regular		Occasional		Never	
	No.	%	No.	%	No.	%	No.	%	No.	%
Gram panchayat	14	18.00	-	-	11	79.00	2	14.00	1	7.00
Co-operative society	55	70.00	2	2.00	29	51.00	28	49.00	-	-
Yuvak mandals	7	9.00	-	-	6	86.00	1	14.00	-	-
Farmer's association	1	1.00	-	-	-	-	1	100.00	-	-

order of 51.00 and 49.00 per cent, respectively. The members of the gram panchayat attended meetings regularly and occasionally in the order of 79.00 and 14.00 per cent, respectively. Similar trend was noticed among the members of yuvak mandals.

Awareness of respondents and extent of contact with extension agents:

The data presented in the table-11 reveals that majority of the respondents were aware of Agriculture Assistant (85.00%), followed by Assist. Agriculture officer (64.00%), subject matter specialist (41.00%), Assist. Director of Agriculture (18.00%), Forest Motivator (26.00%) and Range Forest Officer (14.00%).

The table also revealed that 53.00 and 47.00 per cent of the respondents had regular and occasional contacts with Agriculture Assistant, respectively. More than half (54.00%) of the respondents had occasional contact with Assist. Agriculture officer, followed by regular contact (41.00%) and never contacted (5.00%), respectively.

Sixty two and 36.00 per cent of the respondents had occasional and regular contact with subject matter specialist. While, just 2.00 per cent of them did not contact at all. Majority of them (67.00%) had occasional contact with Assist. Director of Agriculture and only seven per cent of them had regularly contacted.

Fifty two per cent of them contacted range forest officers occasionally and only 5.00 per cent of them had regular contact with the officer. Rest of them (43.00%) did not contact him at all.

Table 11. Awareness of respondents and extent of contact with extension agents

Extension workers	Awareness		Extent of contacts					
			Regular		Occasional		Never	
	No.	%	No.	%	No.	%	No.	%
Agriculture Assistant	127	85.00	60	47.00	67	53.00	-	-
Assist. Agriculture Officer	96	64.00	39	41.00	52	54.00	5	5.00
Subject Matter Specialists	61	41.00	22	36.00	38	62.00	1	2.00
Assist. Director of Agriculture	27	18.00	2	7.00	18	67.00	7	26.00
Range Forest Officer	21	14.00	1	5.00	11	52.00	9	43.00
Forest Motivator	39	26.00	12	31.00	15	38.00	12	31.00

Note : Multiple response obtained

Thirty one and 38.00 per cent of the respondents had regular and occasional contact with the Forest Motivator. While the remaining 31.00 per cent of them never contacted him at all.

Association between selected independent variables with dependent variable (knowledge)

The data presented in the table-12 revealed that the variable, education had positive and significant association with knowledge level of the respondents. Age showed negative and significant association. Two variables, land holding and annual income had non-significant association with the knowledge level of the respondents.

Multiple regression analysis of selected independent variables with dependent variable (knowledge)

The multiple regression analysis results presented in the table-13 revealed that 48.00 per cent of variation in the knowledge level was explained by four independent variables namely age, education, land holding and annual income. The F vale was significant at one per cent level of probability. Further, it was revealed that education had significant contribution for the knowledge level of the respondents.

4.6 PROBLEMS EXPERIENCED BY THE ADOPTERS WHILE ADOPTING AGRO- FORESTRY PRACTICES

It was observed from the table-14 that for planting of trees along field borders/on bunds, 55.00, 33.00 and 12.00 per cent of the adopters faced the

Table 12. Association between selected independent variables with dependent variable (Knowledge)

Independent variables	'r' value
Age	-0.405**
Education	0.679**
Land holding	0.153NS
Annual income	0.159NS

** Significant at 1% level of probability

NS Non significant

Table 13. Multiple regression analysis of selected independent variables with dependent variable (Knowledge)

Independent Variables	Standard Error (SE)	Regression Coefficient (b)	't' Value
Age	2.1645	6.1911	2.860**
Education	6.6464	6.2919	9.467**
Land holding	2.5304	9.8879	0.391NS
Annual income	2.2081	5.8756	0.266NS

** Significant at 1% level of probability $R^2 = 0.48$ $F = 18.53^{*}$

NS Non significant

problems of mortality of seedlings, damage to seedlings by cattle and non-availability of seedlings, respectively.

For adopting planting of trees along irrigation canal 63.00 and 37.00 per cent of them had the programmes of lack of knowledge about suitable trees and mortality of seedling, respectively.

Forty four per cent of the adopters had expressed lack of knowledge about suitable trees/grasses for live bunds. while twenty eight per cent each of them had expressed effect of shade and damage to seedlings by cattle main problems.

While adopting planting of trees inrows practice, respondents had experienced the problems of competition with agricultural crops for solar energy and nutrients (59.00%), mortality of seedlings (29.00%) and lack of irrigation (12.00%), respectively.

Mortality of seedlings (69.00%) and lack of knowledge about suitable trees (31.00%) were the major problems expressed by the adopters while adopting planting of trees in less fertile and waste lands.

For block planting of trees, respondents had the problems of mortality of seedlings (57.00%) and lack of knowledge about tree species suitable for block planting.

Another important component of Agro-forestry is Agri-horti practice, while adopting this practice, adopters experienced lack of availability of seedlings (46.00%), lack of technical guidance for planting of trees (36.00%) and lack of money to purchase seedlings (18.00%) as the major problems.

Table 14. Problems experienced by the adopters while adopting Agro-forestry practices

n=150

Problems	No.	%
1. Planting of trees along field borders /on bunds (n=76)		
a. Mortality of seedlings	42	55.00
b. Damage to seedlings by cattle	25	33.00
c. Non availability of seedlings	9	12.00
2. Planting of trees along irrigation canal (n=24)		
a. Lack of knowledge about suitable trees	15	63.00
b. Mortality of seedlings	9	37.00
3. Establishment of live bunds (n=18)		
a. Lack of knowledge about suitable trees/grasses for live bunds	8	44.00
b. Effect of shade	5	28.00
c. Damage to seedlings by cattle	5	28.00
4. Planting of trees in-rows (n=17)		
a. Competition with agriculture crops for solar energy and nutrients	10	59.00
b. Mortality of seedlings	5	29.00
c. Lack of irrigation	2	12.00
5. Planting of trees in less fertile and waste lands (n=16)		
a. Mortality of seedlings	11	69.00
b. Lack of knowledge of suitable trees	5	31.00
6. Block planting of trees (n=14)		
a. Mortality of seedlings	8	57.00
b. Lack of knowledge about tree species	6	43.00
7. Agri-horti practice (n=11)		
a. Lack of availability of seedlings	5	46.00
b. Lack of technical guidance for planting of trees	4	36.00
c. Lack of money to purchase seedlings	2	18.00

Cont'd....

Cont'd....

8. Planting of trees along field roads (n=10)		
a. Destroying of seedlings by cattle	6	60.00
b. Mortality of seedlings	4	40.00
9. Random planting of trees (n=4)		
a. Difficult to take up intercultural operations	3	75.00
b. Shade effect	1	25.00
10. Silvi-pasture pasture practice (n=3)		
a. Shade effect	2	67.00
b. Lack of land	1	33.00

Table 15. Suggestions of the respondents for better adoption of Agro-forestry practices

n=150

Suggestions	Respondents	
	Number	%
Provision for sale of trees	141	94.00
Conducting demonstrations on Agro-forestry	132	88.00
Providing technical guidance for planting of trees	129	86.00
Provide seedlings of low gestation period	123	82.00
Distribution of more number of fruit seedlings	109	72.66
Provide loan facilities	107	71.33
Free distribution of all type species of seedlings	97	64.66

Note: Multiple response obtained.

For planting of trees along field roads of respondents had undergone the problems of seedlings being destroyed by cattle (60.00%) and mortality of seedlings (40.00%), respectively.

Seventy five and 25.00 per cent of adopters had the difficulty of inter cultural operations and shade effect, respectively, while adopting random planting of trees practice.

Sixty seven and 33.00 per cent of adopters had experienced shade effect and lack of land, respectively for adopting Silvi-pasture practice.

4.7 Suggestions of the respondents for better adoption of Agro-forestry practices

The data presented in the table-15 revealed that majority of the respondents suggested for provision for sale of tree (94.00%), followed by conduct demonstrations about agro-forestry (88.00%), provide technical guidance for planting of trees (86.00%), provide seedlings of low gestation period (82.00%) distribution of more number of fruit seedlings (72.66%), provide loan facilities (71.33%) and free distribution of all type species of seedlings (64.66%), respectively for better adoption of Agro-forestry practices.

DISCUSSION

V DISCUSSION

5.1 RESPONDENT'S KNOWLEDGE OF AGRO-FORESTRY PRACTICES

The results presented in the Table-1, Fig-1 indicated that majority of the respondents (69.00%) belonged to medium level knowledge category. While 19.00 and 12.00 percent of them belonged to low and high knowledge category, respectively.

Respondents choosen for the study were basically farmers and growing mainly food, commercial and oil seed crops. Hence, essentially possess enough knowledge about these crops. The different forest species either grow with or without the knowledge of farmers. But, when they make conscious efforts to grow these tree species and or make use of them for different purposes, start acquiring adequate knowledge. Moreover, 21.00 per cent of them are illiterates. Where 56.00 percent of them had received primary education. Just 5.00 percent of them had studied degree. Further, lesser percentage of them had contact with forest extension agents. Hence, the result that majority of them had medium level of knowledge followed by low and high categories, respectively, regarding agro-forestry practices.

This result is in confirmity with the findings of the study conducted by Ratnakar (1990), Umale *et. al* (1991), Javale and Nachane (1994) who reported that most of the respondents had medium level of knowledge.

5.2 ADOPTION PATTERN OF INDIVIDUAL AGRO-FORESTRY PRACTICES BY THE RESPONDENTS

The results presented in the Table-2, Fig-2 revealed that majority of the respondents adopted the practice, planting of trees along field borders/on bunds (50.66%). The reason for this might be that it is the usual practice to grow tree species along the bunds for various uses. Farmers can encash later on acting as shelterbelt to agricultural crops, reduces erosion of bunds because of Vegetation, economic benefit could be derived by proper utilisation of bunds and/or borders. Over and above this, practice is age old one. So, the farmers might have tendency to follow traditional practices.

This finding got support from results reported by Verma (1990) who opined that farmers had practicised peripheral planting of trees. Remaining nine practices like planting of trees along irrigation canal, establishment of livebunds, planting of tree inrows, planting of trees in less fertile and wastelands, block planting of trees, Agri-horti practice, planting of trees along field roads, random planting of trees, silvi-pasture practices were adopted by lesser percent of respondents. Most probable reasons for this might be that they lack adequate knowledge about these practices, followed by other reasons like adversely affect agricultural crops on their yields by way of competing for nutrients and solar energy, lack of knowledge about proper combination of tree crops with agriculture crops, small land holdings, non availability of required seedlings, higher mortality of seedlings, lack of irrigation facilities and difficult to take up inter-cultural operations.

5.2.1 Adoption of Agro-forestry practices by different categories of farmers

It was observed from the Table-3, Fig-3 that selected all the 10 agro-forestry practices were adopted by farmers belonging to medium category. Except silvi-pasture practices, remaining nine practices were adopted by big farmers.Whereas small farmers adopted six practices, planting of trees along field borders/on bunds, establishment of livebunds, planting of trees inrows, planting of trees in less fertile and wasteland, block planting of trees and planting of trees along field roads. While marginal farmers adopted only two practices namely planting of trees along field borders/on bunds and planting of trees along irrigation canal. This clearly indicates that medium and big farmers adopted more number of practices as compare to small and marginal farmers. The reason for this might be that big and medium farmers are economically sound, have got higher risk proneness, more cosmopolite, have higher education as compare to small and marginal farmers. Further, big and medium farmers might have taught the importance and benefits of agro-forestry for long term sustainable income.

The result is in confirmity with the findings reported by Sainath (1982) and Reddy (1992) who revealed positive and significant association between land holdings and their adoption behaviour.

5.2.2 Tree species planted by the respondents in individual Agro-forestry practices

The results presented in the Table-4, Fig-3a&3b indicated the tree species planted by the respondents in individual agro-forestry practices. Tree

species like Neem, Mango, Coconut, Teak, Eucalyptus, Tamarind and Acacia were planted by 37, 24, 22, 16, 12, 9 and 5.00 per cent of the respondents planted along the field borders/on bunds. It might be due to multipurpose utility of these tree species, availability of such seedlings from the department of forestry as part of social forestry scheme and also farmers might have realised the role of such tree species in reducing bund erosion and protection of agril. crops from heavy winds.

Tamarind, mango and papaya tree species were planted by 62.00, 65.00 and 13.00 per cent of the respondents along with irrigation canal. The reason for this might be that Tamarind, mango and papaya tree species are very commonly made use, viz., Tamarind is used in the preparation of essential ingredients. While mango and papaya are used as common man's fruits. And also, farmers might have realised the utilisation of irrigation canal for meeting various requirements.

Establishment of live bunds practice included planting of susbenia + khusgrass, local grasses and susbenia trees/grasses by 50.00, 39.00, 22.00 and 17.00 per cent of the respondents. Role of such tree species and grasses in reducing erosion of bunds and effective soil and water conservation, useful as green manure and fodder are the main reasons for planting of such tree/grass species.

Coconut, Arecanut, Mango and Banana trees were planted by 35.00, 35.00, 24.00 and 6.00 per cent of the respondents planted trees inrows. The fact that Arecanut is used in preparation of chewing products, while mango and banana are most useful as food, as they are highly nutritious.

Eucalyptus, Neem, Acacia, Mango and Ber trees were planted by the respondents in less fertile and wasteland in the order of 44.00, 50.00, 25.00, 19.00 and 19.00 per cent, respectively. The reason for the might be that such tree species are more drought tolerant and improves soil fertility in long-run and help for economic use of less fertile and waste lands.

Neem (43.00%), Mango (29.00%), Arecanut + Coconut (21.00%), Neem + Mango + Acacia (14.00%) and Tamarind + Mango + Neem (7.00%) were planted by the respondents in block planting of trees practice. The reason for this might be that the planted tree species are useful in several way as they provide fruits, fuel, fodder etc., and also are economical.

In Agri-horti practice, farmers had planted the combination of trees viz., Bengal gram + Coconut (36.00%) Paddy + Coconut (18.00%), Paddy + Ber (9.00%) Groundnut + Papaya (9.00%) and Groundnut + Coconut (9.00%). The reason for this might be that farmers might have realised the benefit of proper combination of crop and tree species on the same unit of land, also they donot heavily compete each other for nutrients and solar energy for their growth.

Neem (40.00%), Raintree (20.00%), Tamarind (10.00%) and Acacia (10.00%) tree species were planted by the respondents along field roads. It is quite logical to say that the purpose of planting of the trees along field roads is to have shade benefit, fruits, timber etc., so this might be the reason for planting such trees along field roads.

Tamarind and coconut plant were planted by 50.00 each per cent of farmers under random planting method. The reason for this might be that, such tree species are considered as most essential,economical and easily available either from department of social forestry or from state department of horticulture.

In the silvi-pasture practice, Neem + Khusgrass and susbenia were planted by 67.00 and 33.00 per cent of the respondents. The reason for this might be that farmers might have realised the importance of this practice, as it helps for utilising less fertile/waste lands for raising silvi-pasture crops. And also, provides fodders for cattle during off season.

5.3 PERCEPTION OF USEFULNESS OF INDIVIDUAL AGRO-FORESTRY PRACTICES BY THE ADOPTERS

The results presented in the table-5 revealed the perception of usefulness of individual Agro-forestry practices by the adopters.

The adopters of planting of trees along field borders/on bunds practice, 42.00, 46.00, 7.00 and 5.00 percent of them perceived that useful as it provides timber,fuel, fodder, fruits etc., reducing erosion of bunds, helps in proper utilisation of land and prevents heavy winds, respectively. This is because, most of the adopters of this practice might have understood and realised the usefulness through past experience of planting of trees. Also, study area had rich forest trees and farmers had knowledge of forest tree species and their usefulness. This might be also contributed for understanding the usefulness of planting of trees along field borders or on bunds.

About 63.00 and 37.00 per cent of the adopters of planting of trees along irrigation canal practice perceived it usefulness in reducing erosion of irrigation canal and provides economic profit, respectively. The above said reasons also holds good here.

The practice, establishment of live bunds was perceived as useful by 61.00, 22.00 and 17.00 percent of the adopters for reducing soil erosion, helps for water conservation and provide fodder for cattle, respectively. This is because of their past experience and realisation.

Planting of trees inrows practice was perceived useful as it more economical, donot come in the way of cultural operations, protects agricultural crops from heavy winds and increases soil moisture, by 29.00, 24.00, 24.00 and 23.00 per cent of the respondents, respectively. The above said reason also holds good here.

With respect to planting of trees in less fertile and waste lands practice, 63.00 and 37.00 per cent of adopters perceived practice was useful for the reasons, improves soil fertility and economic use of less fertile and wastelands, respectively. Knowledge of forest trees and method of their cultivation might be the reason.

Fifty seven and 43.00 per cent of adopters perceived block planting of trees as useful for the reasons, provides timber, fodder, fuel, fruits., and economic profit, respectively. This is because of utility of the practice.

Agri-horti practice was perceived as useful by 64.00 and 36.00 per cent of the adopters for the reasons, more economical and proper utilisation of land,

respectively. Improvement in nutritional level might also contributed for perception of usefulness.

The practice, planting of trees along field roads was perceived useful, because of benefit of shade and provides timber, fodder, fuel etc. by 80.00 and 20.00 per cent of the adopters of the same practice. This might be due to practical experience of the adopters.

Random planting of trees was perceived useful for providing shade and timber, fodder, fuel etc. by 50.00 each per cent of the adopters who followed it. Above said reason here also holds good.

Only three adopters who adopted silvi-pasture practice, each of them felt the practice was useful for the reasons, provides timbers, fuel etc., provide fodder during off season and economic use of less fertile lands, respectively.

5.4 MOTIVATIONAL FACTORS INFLUENCED TO ADOPT AGRO-FORESTRY PRACTICES

It was observed from the Table-6, Fig-4 57.00, 44.00, 36.00, 17.00, 15.00 and 15.00 per cent of the farmers were motivated to adopt agro-forestry practices, since they were of the opinion that the practice provides fruits, fodder and fuel; increases aggregate income, improves economic level, controls soil erosion, distribution of seedlings and improves soil fertility, respectively.

It is an accepted fact that motivation is pre-requisite to achieve success in any field. Therefore, our farmers are not exception for this. In the context of adoption of agro-forestry practices, economic factors played an important role. It is quite

evident that, agro-forestry practices provides fruits, fodder and fuel etc., increases aggregate income, improves economic level,controls soil erosion, distribution of seedlings, improves soil fertility.

The above findings got support from the study conducted by Joshi and Sharma (1989) and Gill (1991).

5.4.1 Motivational sources for adoption of Agro-forestry practices

The table-7 reveals motivational sources for adoption of Agro-forestry practices. It was seen from the table that majority of the farmers motivated on their self followed by extension officers, family members, relatives and friends. The reasons for this might be that farmers might have realised self decision is the best decision, and extent of contact with the Various sources might be also motivated them for adoption of agro-forestry practices.

5.5 PERSONAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

Age

The results presented in the table-8 indicated that, majority of the respondents were middle aged. Usually farmers of middle age are enthusiastic and had more work efficiency than the younger and older ones. Further, individuals of 36 to 50 years of age group have more physical vigour and also have more responsibility towards family than the younger ones. These might be the important reasons to find majority of the respondents in the age group of 36 to 50 years..lh 7

The results was in line with the findings reported by Naik (1993) and Channal (1995) that majority of the farmers were middle aged.

Education

The results revealed that 56.00 percent of the respondents had received primary education. About 14.00, 4.00 and 5.00 percent of them undergone high school, studied upto PUC and graduation level of education, respectively. But 21.00 percent of than were illiterate. Non realisation of the influence of formal education in ones life, poverty and illiteracy of the parents might have come in the way of getting them better education by their parents. Another contributing reason could be the rural social environment which might not have encouraged their parents to give education to the children. As the rural people are still traditional based they generally donot prefer to send their children to college and they expect their children to assist in farm and household activities. The distance of higher study centres from the villages and need for more investment also might have prevented the parents from providing higher education to their children.

The above findings got support from the studies conducted by Khandagode (1982) that more number of farmers had studied upto primary and middle school.

Land holding

Forty six, 28.00 and 16.00 per cent of the respondents were medium, big and small farmers, respectively. Only 10. percent of them were marginal farmers. The reasons that could be attributed to this trend are those who had

agriculture as the main occupation of the family, almost depend on their land for living. So they always try to possess more acres of land. It could also be their ancestor's property.

On the contrary 10.00 percent of them had marginal land holdings. The possible reason could be the ancestral land were broken into small and smaller sized land holdings.

The above finding was in contrast with the findings reported by Reddy (1983), Kumbar (1983) that more number of plantation growing farmers had low land holdings. But the same finding was in confirmity with the findings reported by Hanumanaikar (1995).

Annual income

The economic position of the families of the respondents indicated that 62.00 percent of them were received on annual income upto Rs.11,500 and rest of them received an annual income of Rs.11,500 and above. The possible reasons that could be attributed were, higher proportion of land holdings of farmers comes under rainfed farming and Paddy is the main crop in the study area. Also, erratic and scanty rainfall might attributed or majority of the respondents having annual income upto Rs.11,500.

The above finding was in confirmity with the findings of Narasimha (1980), Purashotham *et. al.* (1988) and Kadam (1991) who reported more number of respondents had low level of income.

Mass media utilisation by the respondents

The results in the table-9 revealed that radio was the most common media which was possessed by majority of the respondents (76.66%). This might be due to that a common man can easily afford to possess radio. The habit of listening to radio mainly depend on individual interest and many of the respondents expressed that they donot get time to listen to radio. Moreover, it overcomes the barrier of illiteracy.

Television is the most popular media, possessed only by 14.00 percent of the respondents. High cost of the television was the main reason for not possessing it. The television viewing behaviour showed that, news, serials, songs are viewed regularly, majority of them viewed Krishidharashan, songs, news, cinema, children's programmes and serials occasionally. Lack of interest, time, language problem and inconvenient timings of the programmes might be attributed to this trend.

One of the cheapest mass communication media, the news paper was subscribed by 10.00 percent of the respondents, but regularly reading habit was found in most of the subscriber respondents. Reason for this might be that majority of the farmers who are illiterates and functional literates must have not realised the importance of newspaper. One more reason might be that they might feel that radio wouldmeet their needs of getting information and entertainment.

The above finding got support from the studies conducted by Sangha and Gupta (1985) and Hanumanaikar (1995) who reported that mass media was considered as credible source of information by majority of the respondents studied.

Participation in social organisation

Co-operative and voluntary organisations take an active role in rural development and are struggling very hard to bring the people under one roof at the local level. The data in the table-10 revealed that , about 70.00 percent of the respondents were members of co-operative society and 2.00 percent were office bearers and nearly equal number of respondents participated regularly and occasionally. The overall memberships in one or more organisations was 52.66 percent.

Only 18.00 percent of the respondents were members of gram panchayat. Nine percent of them were members of Yuvak Mandals and only one percent of them were members of farmer's association. Most of the members participated regularly in the activities of their respective organisations.

This implied that on the whole participation in co-operative societies is very high as compare to other selected organisations. It clearly indicated the interest of the farmers to enroll themselves in co-operatives. This might be mainly because, co-operative work on the principle of democracy and service is the main motto.

The result was in confirmity with the results of the studies conducted by Narasimha (1980), Umamahesh (1985) and Hanumanaikar (1995) who found that majority of the farmers had low level of social participation.

Awareness of respondents and extent of contact with extension agents

The results presented in table-11 revealed that, majority of the

respondents were aware of Agricultural Assistant (5.00%) followed by Assist. Agriculture officer (64.00%), subject matter specialist (41.00%), Assist. Director of Agriculture (18.00%), Forest motivator (26.00%) and Range Forest Officer (14.00%). The variation in the awareness of extension workers is mainly due to fact that head quarter location, familiarity, accessibility and easily availability.

Majority of the respondents contacted Agriculture Assistant. The possible reason might be that the Agriculture Assistant's head quarter is in villages and hence he is easily available for contact in the village itself. The other possible reason might be most of the village selected for the study are head quarters of Agriculture Assistants.

The above finding was in confirmity with the findings of Maligi (1985), Naik (1993) and Hanumanaikar (1995).

Association between selected independent Variables with dependent Variables (Knowledge)

Knowledge of an individual is multidimensional being influenced by many factors. Same of these could be age, education, land holding, annual income etc. These variables were tested for significance of association with the knowledge level of the respondents. As presented in the table-12, out of these variables, only one variable, education revealed positive and significant association with the knowledge level of the respondents regarding the agro-forestry practice. Age, revealed negatively significant with the knowledge level of the respondents. Variables, land holding and annual income showed non-significant association with the knowledge level of the respondents.

Age and knowledge

Age was found to be negatively significant with the level of knowledge. It is implied that aged farmers had low knowledge about the agro-forestry practices. In other words younger respondents had more knowledge.

The negative relationship which was significant might be because young farmers are usually more receptive for new ideas/practice/technology. So, it might have resulted in acquiring more knowledge by young farmers. Old age farmers are more traditional in their outlook, donot want to change their traditional views as they are rigid in their thinking and decision making. The aged farmers are usually less receptive towards the new idea which in turn results in less acquisition of knowledge about technology. On the other land younger farmers might have been convinced more about relative advantages of agro-forestry practices.

The above result was in confirmity with the findings of Aski (1989) who reported negatively significant association between age and knowledge about the subject studied.

Education and knowledge

The relationship between education and knowledge level of the respondents about agro-forestry practices was significant at1.00 percent level of probability. It indicated that there was a relationship between the farmer's level of knowledge and their education. Education has a vital role in acquisition and understanding of the information. Formal education of the respondents might have helped to a greater extent in absorption and understanding the modern complex

technologies. Education widens the horizons of an individual to gain knowledge and become more receptive to the new ideas.

The results gained support from the study conducted by Aski (1989), Sakharkar *et al.* (1992), Jagadale and Nimbalkar (1993) and Pande and Venkaria (1994) who found positive and significant relationship between education and knowledge level.

Land holding and knowledge

The relationship between land holding and knowledge level was found to be non-significant. This means that land holding does not contribute significantly to knowledge level of the respondents. The possible reasons for the above finding might be, individual having larger land holdings usually interested in farming, as commercial farming becoming profitable enterprise in recent year and had little education (Primary level) which might restricted to acquire more information about improved technology.

The result is in confirmity with the findings of Kulkarni *et. al.* (1990) and Angadi *et.al* (1992) who found that non-significant relationship between education and level.

Annual income and knowledge

The relationship between annual income and knowledge level of the respondent was found to be non-significant. This means that irrespective of their annual income respondents had similar level of knowledge. The probable reason for this might be that planting of trees or deliberately retention of trees on the farm is an

age old practice and practiced by majority of the rural families as it provides timber, fodder, fuel etc. Also, study area is very rich in forest trees. So exposure of respondents to forest trees attributed for non-significant relationship between annual income and knowledge level.

The above finding got support from the study conducted by Jagadale (1989) and Badiger *et. al.* (1991).

Multiple regression analysis of selected Independent variables with dependent variable (knowledge)

Pearson's correlation merely portrays co-existence of any two variables. This procedure do not highlight interaction effect. One variable is associated with or is simultaneously dependent upon several others. Knowledge level pastulated as a function of the independent variables included in the study. Therefore, knowledge not solely influenced by any one of these variables taken in isolation but as a part of complex interacting situation. Based on this approach, the multiple regression analysis was carried out to know the important variables with their predictive ability in explaining the variation in knowledge level of the respondents.

Multiple regression analysis of knowledge level revealed that, variables namely age, education, land holdings and annual income put together explained 48.00 percent variation in the knowledge level. Among these variables, education contributed significantly for the variation in knowledge. So, this could be considered as a crucial variable in explaining the variation in the knowledge level of the respondents. The tested variables are personal in nature, hence this might explained 48.00 percent variance in knowledge level.

5.6 PROBLEMS EXPERIENCED BY THE ADOPTERS WHILE ADOPTING AGRO- FORESTRY PRACTICES

The respondents were asked to express their problems experienced while adopting agro-forestry practices on their farmers and presented in the table-14. The table reveals the several problems like mortality of seedlings, damage to seedlings by cattle, non-availability of seedlings, lack of knowledge about suitable tree species, effect of shade, competition with agricultural crops for solar energy and nutrients, lack of irrigation, lack of technical guidance for planting of trees, lack of money to purchase seedlings, difficult to take-up intercultural operations and lack of land etc. The reasons to express all such problems might be mainly due to farmer's past experience and realisation while adopting the agro-forestry practice. Also, these problems are quite common.

Constraints expressed are many. Each of one which is important in a different perceptive. These problems warrant due attention to be paid to individual constraints, in order to create a constrains free atmosphere. Which could favour large scale adoption of agro-forestry by the respondents.

The above result got support from the studies conducted by Krishna Moorthy (1990), Umale *et al*(1991) and Saikh *et. al.*(1993).

5.7 SUGGESTIONS OF THE RESPONDENTS FOR BETTER ADOPTION OF AGRO-FORESTRY PRACTICES

The suggestions offered by the respondents for better adoption of agro-forestry practices are depicted in the table-15.

It was observed from the table that majority of the respondents had expressed suggestions like provision for sale of trees (94.00%), conducting demonstrations on agro-forestry (88.00%), providing technical guidance for planting of trees (86.00%), provide seedlings of low gestation period (82.00%), distributor of more number of fruit seedlings (76.66%), provide loan facilities (71.33%), free distribution by seedlings (64.66%). Exposure to practical problems and logical thinking of the farmers to solve the existing problems of agro-forestry might be the reasons to give above said reasons.

These aforesaid suggestions helps for taking remedial measures and formulating suitable policy options. Given due consideration to theses suggestions, there is every possibility for a very favourable atmosphere to encourage farmers to go in for adoption of agro-forestry practice.

SUMMARY

VI SUMMARY

Agro-forestry plays an important role in sustainable production of agriculture crops and trees through proper land management. It is not new to our rich heritage, but has gained more importance in the lost 5-6 years in the succession to the taungya system of agri-silviculture. In agro-forestry production system, trees protect agriculture crops in the dry inhospitable climate by conserving soil moisture, increasing the atmospheric humidity and providing protective cover from scorching and dissicating winds.

India has 2.2 per cent (329 m.ha) of world's geographical area (14900 m.ha) and 1.88 per cent (75.2 m.ha) of world's forest area (3800 m.ha). While Karnataka State has total geographical area of 19.2 m.ha with population of 44 million. The forest area in the state is 3.86 m.ha.

Population explosion in India has increased pressure on land, forests and forest products. So, agricultural land cannot be directed to forest as it is already under pressure. In the this context, proper integration of trees with field crops seems to be better alternative to meet the growing needs. Thus it was necessary to study the knowledge, adoption and usefulness of agro-forestry practices.

The study was conducted during the year 1994-95 in Hangal taluk, Dharwad district. There are six Assistant Agril. Officer's ranges and 26 Agril. Assistants circles under the jurisdiction of the taluka for selection of ranges, circles and

villages, simple random sampling procedure was followed. Accordingly, three ranges, two circles from each range and two villages from each circle were selected. Thus, totally 12 villages from the taluka were selected for the study. Depending on the number of farm families in each village, size of the sample per village was determined by following the proportionate sampling procedure against the total sample size of 150. On the light of the objectives set for the study, the variables such as knowledge, adoption and perception of usefulness were studied as the dependent variables, and variables -age, education, land holding, annual income, social participation, extension contact and mass media utilisation were studied as independent variables.

A teacher made knowledge test was developed to measure the knowledge level of the farmers by following scoring procedure developed for the study. A questionnaire was formulated using the package of practices booklet developed jointly by university of Agricultural Sciences, Dharwad and Karnataka State Department of Agriculture for elicit the information from the respondents. Data were collected, tabulated, and analysed by using suitable statistical measures.

The major findings of the study are as follows.

1. Sixty nine per cent of the respondents had medium knowledge of agro-forestry practices.
2. Majority of the respondents had adopted the practice, planting of trees along field borders/on bunds (50.66%), followed by planting of trees along irrigation canal practice (16.00%) and rest of the practices were adopted by lesser per cent of the respondents.

3. Almost all the practices were adopted by medium and big farmers, while small and marginal farmers adopted only few practices.
4. Tree species like Neem, Mango, Coconut, Teak, Eucalyptus, Tamarind and Acacia were planted by 37.00, 24.00, 22.00, 16.00, 12.00, 9.00 and 5.00 per cent of the respondents planted along the field borders/on bunds. While Tamarind, Mango, and papaya trees were planted by 62.00, 65.00 and 13.00 per cent of the respondents along the irrigation canal.
5. Establishment of live bunds practice included planting of susbenia + Khusgrass, local grasses and susbenia trees/grasses by 50.00, 39.00, 22.00 and 17.00 per cent of the respondents.
6. Coconut, Arecanut, Mango and Banana trees were planted by 35.00, 35.00, 24.00 and 6.00 per cent of the respondents planted trees inrows. Whereas, Eucalyptus, Neem, Acacia, Mango and Ber (each) trees were planted by the respondents in less-fertile and waste lands in the order of 44.00, 50.00, 25.00, 19.00 and 19.00 per cent, respectively.
7. In block planting of trees practice, Neem, Eucalyptus+Neem, Arecanut + Coconut, Neem + Mango + Acacia and Tamarind + Mango + Neem tree species were planted by 43.00, 29.00, 21.00, 14.00 and 7.00 per cent of the respondents, respectively.
8. In Agri-horti practice, farmers had planted the combination of trees viz. Bengal gram + Coconut, Paddy + Coconut, Paddy + Ber, Groundnut + Papaya and Groundnut + Coconut in the order of 36.00, 18.00, 9.00, 9.00 and 9.00 per cent, respectively.

9. Planting of trees along field roads practice was made use of 40.00, 20.00, 10.00 and 10.00 per cent of farmers to plant Neem, raintree, Tamarind and Acacia, respectively.
10. Tamarind and coconut plants were planted by 50.00 each per cent of the farmers under random planting method.
11. In the silvi-pasture practice, Neem + Khusgrass and susbenia were planted by 67.00 and 33.00 per cent of the respondents, respectively.
12. Among the adopters of planting of tree along field borders/on bunds practice, 42.00, 46.00, 7.00 and 5.00 per cent of them perceived that useful it is for providing timber, fuel, fodder, fruits. etc. reducing erosion of bunds, helps in proper utilisation of land and prevents heavy winds respectively.
13. About 63.00 and 37.00 per cent of the adopters of planting of trees along irrigation canal practice perceived it usefulness in reducing erosion of irrigation canal and provides economic profit, respectively.
14. Establishment of livebunds practice was perceived as useful by 61.00, 22.00 and 17.00 per cent of the adopters for reducing soil erosion, helps for water consideration and provides fodder for cattle, respectively.
15. The practice, plantation of trees inrows was perceived as useful for the reasons, more economical, do not come in the way of cultural operations, protects agril. crops from heavy winds and increases soil moisture by 29.00, 24.00, 24.00 and 23.00 per cent of the respondents, respectively.
16. With respect to planting of trees in less fertile and waste lands practice, 63.00 and 37.00 per cent of adopters perceived it as useful for the reasons, improves soil fertility and economic use of less fertile and waste lands, respectively.

17. Fifty seven and 43.00 per cent of adopters perceived block planting as trees as useful for the reasons, provides timber, fodder, fuel, fruits and economic profit, respectively.

18. Agri-horti practice was perceived as useful by 64.00 and 36.00 per cent of the adopters for the reasons, more economical and proper utilisation of land, respectively. 19. Planting of trees along field roads practice was perceived useful, because of benefit of shade and provides timber, fodder, fuel etc. by 80.00 and 20.00 per cent of adopters of the same practice.

20. Random planting of trees was perceived as useful for providing shade and timber, fodder, fuel etc. by 50.00 each per cent of the adopters who followed it.

21. Only three adopters who adopted silvi-pasture practice, each of them felt the practice was useful for the reasons, provides timber fuel etc. provide fodder during off seasons and economic use of less fertile lands, respectively.

22. About 57.00, 44.00, 36.00, 17.00, 15.00 and 15.00 per cent of the farmers were motivated to adopt Agro-forestry practices, since they were of the opinion that the practices provides fruits, fodder and fuel, increases aggregate income, improves economic level, controls soil erosion, distribution of seedlings and improves soil fertility, respectively.

23. Majority of the respondents were self-motivated (60.00%) followed by extension officers (44.00%), family members (39.33%), relatives (4.00%) and friends (2.66%), respectively.

24. Majority of the respondents belonged to middle age group (49.00%), while 27.00 and 24.00 per cent of them were belonged to young and old age group, respectively.

25. Fifty six per cent of the respondents had received primary education, while 14.00, 4.00 and 5.00 per cent of them had undergone high school, studied upto PUC and graduation, respectively. But 21.00 per cent of there were illiterate.

26. Forty six per cent of the respondents had medium size land holdings.

27. Majority of the respondent's (62.00%) families had and annual income of Rs.11,500.

28. Majority of the respondents (77.66%) possessed radio and were occasional listeners.

29. Cent per cent of subscribes of the news paper read regularly.

30. Majority of the respondents (70%) were members of co-operative Society.

31. Majority of the respondents (85.00%) were aware of agricultural Assistants and contact with same was also high.

32. A positive and significant association was observed between education and level of knowledge.

33. The multiple regression analysis indicated that 48.00 per cent of the variation was explained by four variables and education had significant effect on knowledge level.

34. Mortality of seedlings, damage to seedlings by cattle, lack of availability of seedling, lack of knowledge about suitable trees, effect of shade, competition with agriculture, crops for solar energy and nutrients, lack of irrigation, lack

of technical guidance for planting of trees, lack of money to purchase seedlings, difficult to take up intercultural operations and lack of land etc. were the problems expressed by adopters while adopting agroforestry practices.

35. Majority of the respondents and expressed suggestions like provision for sale of trees (94.00%), conduct demonstrations of agro-forestry (88.00%), provide technical guidance for planting of trees (86.00%), provide seedlings of low gestation period (82.00%), distribution of more number of fruit seedlings (72.66%), provide loan facilities (71.33%) and free distribution of all type species of seedlings (64.66%), respectively.

IMPLICATIONS

Based on the findings of the present study, the following implications could be made.

1. The study brought out that 69.00 per cent of the respondents belonged to medium level of knowledge about agro-forestry practices. Hence, it is imperative that forest department should make concrete efforts to educate farmers on agro-forestry and other related aspects.
2. Fifty one per cent of the respondents adopted age old, common practice planting of trees along field border/on bunds, rest of the practices were adopted by few farmers. Hence, farmers need to be educated, convinced about the importance of planting of trees on their farms in long run and also provide them required facilities by the staff of the social forestry department.
3. Majority of medium and big farmers adopted all selected agro-forestry practices. While few practices were adopted by the small and marginal

farmers. Therefore, small and marginal farmers should also be convinced about the benefit of forest trees in protecting agril. crops and increasing aggregate income over a period of time.

4. Majority of the respondents had expressed suggestions like provision for sale of tree (94.00%), conducting demonstration on agri-forestry (88.00%), provide technical guidance for planting of trees (86.00%), provide seedlings of low gestation period (82.00%), distribution of more number of fruit seedlings (72.66%), provide loan facilities (71.33%) and free distribution all type species of seedlings (64.66%) for better adoption of agro-forestry practices. Hence, all these suggestions should be taken into consideration while popularising the practices by the department of social forestry.

SUGGESTIONS FOR FURTHER STUDY

The independent variables included in the present study were explained the variation in the knowledge level of the respondents on agro-forestry practices to a limited extent only few variables have been selected for the study. So, comprehensive studies with inclusion of some other independent variables are needed so as to arrive at valid conclusions.

REFERENCES

REFERENCES

*AJAYKUMAR, P., 1989, A study on adoption behaviour and information consultancy pattern of grape growers in Ranga Reddy district of Andhra Pradesh. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci. Bangalore.

ANGADI, J.G., JAHAGIRDAR, K.A. AND SHINDE, P.S., 1992, Awareness knowledge of farmers about improved cultivation practices of groundnut. *Maharashtra J. Extn. Edn.*, **11** : 356-357.

ASKI, S., 1989, A comparative study on knowledge level and adoption behaviour of trained and untrained farmers of FTC Arabhavi, *M.Sc. (Agri.), Thesis (Unpubl.),* Univ. Agric. Sci., Dharwad.

BADIGER, C., GAVIMATH, U. AND NADAGOUDAR, B.S., 1991, Knowledge and participation of farm women in forestry. *Maharashtra J. Ext. Edn.*, **10** : 87-91.

BHOPALE, R.S., 1992, Case study of Ber cultivation. Research report, Punjabrao Krishi Vidyapeeth, Akola, pp. 43-58.

BHOPLE, R.S., SAGNE, M.R. AND NIKHADE, D.M., 1991, Constraints in adoption of dryland technology. *Maharashtra, J. Extn. Edn.*, **10** (1) : 61-67.

CHAND, M. AND SHARMA, D.D., 1993, Knowledge and adoption of recommended apple cultivation technology through lab to land programme in Himachal Pradesh. *Maharashtra J. Extn. Edn.*, 12 : 341-344.

CHANDRAKANDAN, K.M., NAGOOR, M. AND PHILIP, H., 1989, Farmer's perception on correspondence course programme of Tamil Nadu Agril. University. *Rural development review*, 8 (3 & 4) : 853-854.

CHANNAL, G.P., 1995, Study on knowledge and adoption behaviour of shareholders and non-shareholders of co-operative sugar factories in Belgaum district. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Dharwad.

*COOK, C.C. AND GRUT, M., 1989, Agro-forestry in sub-saharan Africa: A farmer's perspective. World Bank Technical paper. No.112, 99 pp. ISSN : 0253-7494.

*GILL, A.S., 1991, Exploring Agro-forestry for fodder production in Vietnam. *Agro-forestry* Today, 3:8.

GOSWAMY, P.C., 1982, Agro-forestry practices and prospects as a combined land use system. *Indian For.* 108 : 385-386.

HANUMANAIKAR, R.H., 1995, A study on knowledge, adoption and marketing behaviour of sunflower growers in Dharwad district. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Dharwad.

HEGDE, V.S., 1986, Adoption behaviour utility pattern of information sources consulted and reasons influencing partial adoption and non-adoption of cardamom by farmers of Uttar Kannada, *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

*HELIN, W.H., 1989, Irrigated Agro-forestry, the Luug experience, Magadishu, Somalia, Church world service pp-2.

*HUXLEY, P.A., 1983, Plant research in Agro-forestry, ICRAF, Nairobi.

JAGADALE, K.H., 1989, A study on knowledge and adoption of recommended cultivation practices of cabbage growing farmers of Belgaum district, Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Dharwad.

JAGADALE, U.D. AND NIMBALKAR, S.D., 1993, Role of socio personal economic and psychological characteristics of farmers on knowledge level about the improved dry and technology. *Maharashtra J. Extn. Edn.*, 12: 119-123.

JAVALE, P.S. AND NACHANE, M.N., 1994, Socio-personal characteristics and adoption of recommended practices for mango and citrus crops. *Maharashtra J. of Extn. Edn.*, 13 : 135-139.

JOSHI, B.V., 1992, A study on paddy cultivation pattern by Tibetan rehabilitants and their socio-economic characteristics, Mundagod taluka,

Karnataka. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Dharwad.

JOSHI, V.D. AND SHARMA, D.K., 1989, Social forestry in relation to its adoption by the farmers with special reference to their psychological attributes. *Maharashtra J. Extn. Edn.* **8** : 1-6.

KADAM, K.R., 1991, Role performance of contact farmers in T and V system. *Maharashtra J. Extn. Edn.*, **10** (2) : 164-166.

KANTARAJ, 1989, A study on adoption of improved practices of coffee and cardamom by small farmers in Hassan district of Karnataka. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

KHANDAGODE, K.D., 1982, Influence of rural credit on adoption of agriculture practices by citrus growers in panchayat samiti, Nagpur, *M.Sc. (Agri.) Thesis (Unpubl.)*, P.K.V., Akola.

KING, K.G. AND CHANDLER, M.T., 1978, *The wasted lands.* ICRAF, Nairobi, Kenya.

*KOTHEKAR, G.M., 1987, A study of constraints in orange cultivation as perceived by orange growers in panchayat samiti, Kalmeshwar. *M.Sc. (Agri.) Thesis (Unpubl.)*, P.K.V., Akola.

KULKARNI, M.V., NANDAPURKAR, G.G. AND CHITNIS, D.H., 1990, Knowledge of farm woman regarding agricultural practices, *Maharashtra J. Extn. Edn.*, **11**: 141-143.

KUMBAR, S.V., 1983, A study on adoption behaviour and consultancy pattern of grape growers of Bijapur district in Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)*., Univ. Agric. Sci., Bangalore.

*KRISHNAMOORTHY, K., 1990, An economic analysis of Agroforestry in Mettupalayam taluk in Coimbatore district. *M.Sc.(Agri.) Thesis (Unpubl.)*, TNAU, Coimbatore.

LANJEWAR, D.M. AND SHIRKE, R.A., 1991, Perception about social forestry among farmers. *Maharashtra J. Extn. Edn.*, **10**: 93-98.

*LEACH, G. AND MEARNS, R., 1988, *Beyond the wood fuel crisis.* People, land and trees in Africa, Earthscan, London, p.309.

LIANBIKA, B. AND NIKHADE, D.M., 1993, Adoption behaviour of pineapple growers in mizoram, *Maharashtra J. Extn. Edn.*, **12**: 25-29.

MALIGI, S.N., 1985, Adoption behaviour and value orientation of adopters and non-adopters of soybean in Kalaghatagi taluk of Dharwad district. *M.Sc.(Agri.) Thesis (Unpubl.)*, Univ. Agric. Sci., Bangalore.

MANJUNATH, L., 1980, Comparative study on knowledge level and adoption behaviour of trained and untrained farmers in Ghataprabha command area of Karnataka state. *M.Sc.(Agri.) Thesis (Unpubl.)*, Univ. Agric. Sci., Bangalore.

MARILINGANNAVAR, R.N. AND MANJUNATH, L., 1992, A study on socio-economic characteristics and existing sheep rearing pattern of shepherd in Dharwad district Karnataka, *J. Agric. Sci.*, **5**(1): 53-62.

MUNDRA, S.N. AND KOTHARI, K., 1988, Sources of motivations and motives responsible for participation of women in TRYSEM. *Maharashtra J. Extn. Edn.*, **7** : 7-11.

MUTHAYYA, B.C. AND LOGANATHAN, M., 1990, Psycho-social influencing entrepreneurship in rural areas. *J.Rural Development.*, **91** : 237-281, NIRD, Hyderabad.

NAIK, R., 1993, A study on awareness, attitude and use pattern of seed supplying agencies by farmers in Dharwad district, Karnataka, *M.Sc. (Agri.) Thesis (Unpubl.)*, Univ. Agri. Sci., Dharwad.

NARASIMHA, B., 1980, A study on the impact of farmer training on knowledge and adoption behaviour of farmers in Malaprabha command area of Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

NIMJE, N.R., KULKARNI, V.V. AND CHOUDHARI, D.P., 1991, Knowledge and skills about ber cultivation practices among farmers, *Maharashtra J. Extn. Edn.*, **10** (2) : 108-110.

NIMJE, N.R., SINHA, R.R. AND CHOUDHARI, D.P., 1992, Profile of trainees and their perception about the national workshops. *Maharashtra J. Extn. Edn.* **11** : 227-233.

PANDE, R.D. AND VENKARIA, R.S., 19194, Knowledge and adoption behaviour of banana growers. *Maharashtra J. Extn. Edn.*, **13** : 289-290.

PATEL, M.M., CHATTERJEE AND SHARMA, H.O., 1994, Knowledge and adoption level of sugarcane growers. *Maharashtra J. Extn. Edn.*, **13** : 131-134.

PATIL, B.N., KUBDE, V.R. AND KALANTRI, L.B., 1991, Diagnostic study of Agro-forestry in Vidarbha Region of Maharashtra State. *Maharashtra J. Extn. Edn.*, **10** : 107-114.

PUJAR, A.C., 1993, Innovative proneness and socio-economic profile of trained women of Krishi Vignana Kendra, Hanumanatti, Dharwad district. *M.Sc. (Agri.) Thesis (Unpubl.)*, Univ. Agric. Sci., Dharwad.

PURUSHOTHAM, V., KOPPUTHAI, V. AND DEVI, N., 1988, National profile of selected expectant mother and the cost of pregnancy. *Ind. J. Nutr. dietat.*, **25** (8) 247-248.

RATNAKAR, R., 1990, Impact of ITDA on tribal farmers of Khammum district of Andhra Pradesh. *Ph.D. Thesis (Unpubl.) in Agric. Extn.*, Andhra Pradesh Agriculture University, Hyderabad.

RAVINDRA, M., 1980, Study of knowledge adoption and perception of recommended poultry management practices among poultry farmers of Bangalore district. *M.Sc. (Agri.) Thesis (Unpubl.)*, Univ. Agric., Sci., Bangalore.

REDDY G.M., 1983, A study on adoption behaviour of banana growers of Tungabhadra Project Area in Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

ROTTI, N.B., 1983, A study on knowledge and adoption behaviour of sugarcane growers of Belgaum district in Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)*, Univ. Agric. Sci., Bangalore.

SADAQUATH, S., CHANDARAGI, D.M. AND SUNDARASWAMY, B., 1994, Knowledge level of farmers about farm forestry. *Maharashtra J. Extn. Edn.*, 13 : 47-50.

SAIKH, A.M., BAJAJ, S.S. AND GONDKAR, P.P., 1993, A study of adoption of Custard Apple technology by the growers *Maharashtra J. Extn. Edn.*, 12 : 55-58.

SAINATH, S., 1982, A study on adoption behaviour and motivation pattern of grape cultivators in Bangalore district of Karnataka state. M.Sc. *(Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

SAKHARKAR, V.S., NIKHADE, D.M. AND BHOPLE, R.S., 1992, A correlation study of knowledge and adoption behaviour of soybean growers. *Maharashtra J. Extn. Edn.*, 11 : 212-217.

SINGH, H. AND PATEL, H.N., 1990, Knowledge level and socio-economic characteristics of contact and non-contact farmers. *Maharashtra J. Extn. Edn.*, 9 : 178-180.

SINGH, R.P. AND KORWAR, G.R., 1986, Agro-forestry options for drylands in India. *Indian J. Dryland Agric. Res. Dev.*, **1** : 1-10.

SINHA, R.R., RAHAD, B.G. AND INGLE, P.O., 191, Changing scenario of Dryland Horticulture in Tribal Area. *Maharashtra J.Extn. Edn.* **10**: 75-80.

TIWARI, S.C., GULARIA, J. AND SHARMA, R.K., 1990, Capital and credit needs of Western Himalayan Farmers for Agro-forestry. *Agricultural situation in India,* **45** (9) : 589-591.

THIMAPPA, H., 1981, A study on adoption behaviour and motivation pattern of coconut cultivators in Tumkur district of Karnataka state. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

UMALE, P.B., BHOPLE, R.S. AND SANGANE, M.A., 1991, Adoption of Agro forestry by farmers, *Maharashtra J. Extn. Edn.*, **10** : 145-148.

UMAMAHESH, A.B., 1985, Influence of peripatic training of farmers in the adoption of DCH-32 cotton. A field experiment. *M.Sc. (Agri.) Thesis (Unpubl.)* Univ. Agric. Sci., Bangalore.

UPADHYAY AND HANSRA, 1982, Utility of Agricultural Broadcasts of Radio, Nepal as perceived by Nepalese farmers. *Maharashtra J. Extn. Edn.*, **18**(3 & 4): 68-69.

VEENA JAIN AND SINHA, T.R., 1983, Differential perception of farm women regarding immunisation practice. *Maharashtra J. Extn. Edn.*, **2**: 21-26.

VENKATAPRABHU, J., 1993, Diagnostic study on agro-forestry in Research, Extension and clientele perspectives. *Ph.D. Thesis (Unpubl.)*, TNAU, Coimbatore.

*VENUGOPAL REDDY, C.H., 1992, A study to identify the constraints in adoption of improved mango production technology in Khammam district of Andhra Pradesh. *M.Sc. (Agri.) Thesis (Unpubl.)* in Agric. Extn., Rajendranagar, Hyderabad.

*VERMA, D.P.S., 1990, Agro-forestry practice of Gujarat state. *International tree crops Journal*, **6**(1) : 17-30.

---

*Original not seen.

APPENDICES

INTERVIEW SCHEDULE

APPENDIX-I

Knowledge test:

1. **Agro-forestry means-**

a. Growing of trees along with agriculture crops.

b. Growing of trees alone in the field.

c. Don't know.

2. **Which are the benefits of growing of horticulture crops.**

a. Provides fruits

b. Provides timbers

c. Economic benefit

d. Above all are correct

e. Don't know.

3. **Which are the losses of destroying of forests.**

a. Reduces rainfall

b. Increases atmospheric temperature

c. Increases fuel and timber problems

d. Creates deficit of fodder for cattle

e. Forest animals destroy agriculture crops.

f. Above all are correct.

g. Don't know.

4. **To avoid destroying of forest what should be done?**

a. Growing of trees in cultivable, less fertile and waste lands.

b. Stop the forest theft.

c. Create awareness about importance of forest.

d. Create awareness about improved chulla and limited use of fuel.

e. Avoid the entrance of cattle into the forests.

f. Above all are correct.

g. Don't know.

PLANTING OF TREES ALONG FIELD BORDERS/ON BUNDS PRACTICE

5. What are the benefits of planting of trees along field borders/on bunds.

a. Prevents erosion of bunds.

b. Provides timber, fuel, fodder, fruits etc.

c. Provides economic benefits.

d. Above all are correct

e. Don't know.

6. Mention the suitable tree species of timber

a. Neem, sisso, Mango, *Albegia lebek*(Bagi), *Casia semia*

b. Don't know.

7. Mention the suitable tree species of fuel

a. *Acacia nilotica, Acacia auricoliformis, casurina equisetifola, Lucania lucocephala, Fungemia Pirneta.*

b. Don't know.

8. Mention the suitable tree species of fodder

a. *Hardwickia binneta, Lucana lucocephala, Prasophis Cineraria* (Banni), *Biuhinia recimosa.*

b. Don't know.

9. Mention the suitable tree species of fruits

a. Mango, Tamerind *(Tamerindus indica), Pithecalobium dulce, Sysygium Cumini* (Jamun), Ber, wood apple *(Foronia elephantum).*

10. Mention the suitable tree species of agricultures implements.

a. *Acacia nilotica, Prosophis Cineraria,* Neem, *Agave amelicama.*

b. Don't know.

PLANTING OF TREES IN ROWS PRACTICE

11. Mention the suitable tree species for planting of trees in rows practice.

a. Subabul, Sisso *(Dulbergia sisso),* Acacia auricoliformis, casurina, *Hardwickia binneta.*

b. Don't know.

AGRI-HORTI PRACTICE

12. Mention the suitable tree species for Agri-horti practice.

a. Fig *(Ficus caria),* Ber,Pomagranate, Guva, *ambelica officinalis,* custerd apple, sapota.

b. Don't know.

13. Mention the suitable crops for Agri-horti practice

a. Green gram, cowpea, blackgram, setaria, Groundnut, Bengalgram, Mustard, Wheat, field bean, soybean,

b. Don't know.

SILVI- PASTURE PRACTICE

14. Mention the suitable tree species for silvi-pasture crops.

a. *Albegia lebeck,* Subabal, Neem, Anjan, Sisso, *Acacia nilotica,* Tamerind, *Prosophis cineraria* (Banni) casurina, *Acacia auricoliformis, Acacia albida.*

b. Don't know.

15. Mention the suitable pasture crops for silvi-pasture practice

a. Anjan grass, Khus grass, Nepear bajra species.

b. Don't know.

RANDOM PLANTING OF TREE PRACTICE

16. Mention the suitable tree species for random planting of trees practice.

a. Neem, Jamun, Mango, Tamerind, Anjan, Sisso, *Prosophis cineraria,*

b. Don't know.

ESTABLISHMENT OF LIVE BUNDS PRACTICE

17. What are the uses of livebunds.

a. Soil and water conservation.

b. Less expensive and highly beneficial.

c. Both are correct

d. Don't know.

18. Mention the suitable trees/grasses for live bund practice

a. Subabul, grasses, Glyricidia, Susbenia, redgram, Desmenthus fodder crops.

b. Don't know.

PLANTING OF TREES IN LESS FERTILE AND WASTE LANDS PRACTICE

19. Mention the suitable tree species for less fertile and waste lands.

a. Subabul, custerd apple, Ber, Tamerind, Neem, *Acacia nilotica Acacia auricoliform's, Eucalyptus.*

BLOCK PLANTING OF TREE PRACTICE:

20. Mention the suitable tree species for block planting of trees practice.

a. Subabul, casurina, Sisso, *Albegia lebek*, Anjan, Raintree, *Prosophis Cineraria* Neem, Mango, Tamerind, Ber,

b. Don't know.

PLANTING OF TREES ALONG FIELD ROADS AND IRRIGATION CANAL PRACTICE

21. What are the uses of planting of trees along field roads and irrigation canals?

a. Obtain more benefit from available land.

b. Reduces erosion of canals.

c. Both are correct.

d. Don't know.

22. Mention the suitable tree species for planting of trees along field roads and irrigation canal practice

a. Raintree, Neem, *Acacia nilotica,* peltoprum, *Albegia lebek, Delonix regia,* Tamarind, Mango, *Thespesia Populni, Acacia auricoliformis, Ficus glomorata,*

b. Don't know.

MANAGEMENT OF TREES:

23. What should be done to avoid retardent growth of agriculture crops

a. Cut the branches of trees during summer season.

b. Cut the branches of trees before flowering.

c. Open the trench about one meter away from the tree with depth of 60-90 an to keep control of growth of roots.

d. Don't know.

:YIELD:

24. **Growing of trees with agriculture crop helps to _____ the aggregate income.**

a. To increase.

b. To decrease.

c. Don't know.

APPENDIX-II

Adoption pattern and problems experienced while adopting agro-forestry practices.

1. Did you adopted planting of trees along field borders/on bunds practice? Yes/No,

   If yes, give details

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

2. Did you adopted planting of trees in rows practice? Yes/No.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

3. Did you adopted Agri-horti practice? Yes/No. if yes, give details.

No.	Agriculture crops	Horticulture crops	Problems experienced while adopting
1.			
2.			
3.			
4.			

4. Did you adopted silvi-pasture practice? Yes/No.

If yes,give details.

No.	Tree species	Fodder crops	Problems experienced while adopting
1.			
2.			
3.			
4.			

5. Did you adopted random planting of trees practe? Yes/No. If yes, give details.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

6. Did you adopted establishment of live bunds practice? Yes/No. If yes, give details.

No.	Trees/grasses species	Problems experienced while adopting.
1.		
2.		
3.		
4.		

7. Did you adopted planting of trees in waste and less fertile lands practice? Yes/No. If yes, give details.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

8. Did you adopted planting of trees along field roads practice? Yes/No. If Yes, give details.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

9. Did you adopted planting of trees along irrigation canal ? Yes/No. If yes, give details.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

10. Did you adopted block planting of trees practice? Yes/No. If yes, give details.

No.	Tree species	Problems experienced while adopting
1.		
2.		
3.		
4.		

APPENDIX-III

Perception of usefulness of agro-forestry practices.

1. Mention the usefulness of planting of trees along field borders/on bunds practice.

1.

2.

2. Mention the usefulness of planting of trees in rows practice.

1.

2.

3. Mention the usefulness of Agri-horti practice

1.

2.

4. Mention the usefulness of silvi-pasture practice.

1.

2.

5. Mention the usefulness of random planting of trees practice.

1.

2.

6. Mention the usefulness of establishment of live bunds practice.

1.

2.

7. Mention the usefulness of planting in trees in less fertile and waste lands practice.

1.

2.

8. Mention the usefulness of planting of trees along field roads.

1.

2.

9. Mention the usefulness of planting of trees along irrigation canals.

1.

2.

10. Mention the usefulness of block planting of trees practice.

1.

2.

APPENDIX-IV

Motivational factors and sources influenced to adopt agro-forestry practice.

Sl.No.	Factors	Sources
1.	Provides food, fruits, fodder and fuel	1. Self
2.	Prevents soil erosion.	2. Family members
3.	Distribution of seedlings.	3. Relatives
4.	Increase soil fertility	4. Friends
5.	Increases aggregate income.	5. Extension officer
6.	Improves economic level.	6. Other.

APPENDIX-V

Suggestions for better adoption of agro-forestry practices.

1. Provide loan facilities.
2. Provide low gestation period seedlings.
3. Distribute more number of fruit seedlings.
4. Free distribution of all types of seedlings.
5. Provide technical information about planting of trees.
6. Conduct demonstrations about agro-forestry.
7. Provision for sale of trees.
8. Others.

APPENDIX-VI

1. General information :-

a) Name of the respondent :
b) Village :
c) Taluka :

2. Personal information :-

a) Age (in year) :
b) Education
Illiterate :
Primary education :
High School :
College :
Graduate :

3. Land holding (in acres)

Dry :
Irrigated land :
Garden :

4. Annual income (in Total rupees):

Income from agriculture :
Others :
Total ::

5. Social participation:-

No.	Institutions	Member office bearer	Participation		
			Regular	Occasional	Never
1.	Gram Panchayat				
2.	Co-operative Society				
3.	Yuvak Mandals				
4.	Farmers Association				

6. Extension contact :

No.	Extension agents	Aware	Frequency of contact		
			Regular	Occasional	Never
1.	Agricultural Assistant				
2.	Assist. Agriculture Officer				
3.	Subject Matter Specialist				
4.	Assist. Director of Agriculture				
5.	Range Forest Officer				
6.	Forest Motivator				

7. Mass media utilisation :

a) Do you posses radio ? Yes/No

If yes, give details.

No.	Programmes	Listening behaviour		
		Regular	Occassional	Never
1.	Krishiranga			
2.	News			
3.	Suggestion for farmers			
4.	Songs			
5.	Dramas			
6.	Children's programme			

b) Do you possess Television ? Yes/No
If yes, give details

No.	Programmes	Viewing behaviour		
		Regular	Occasional	Never
1.	News			
2.	Krishidarshan			
3.	Songs			
4.	Cinema			
5.	Serials			
6.	Children's programme			

c) Are you subscriber to any newspapers ? Yes/No

If yes, give details

No.	Name of magazines	Reading behaviour		
		Regular	Occasional	Never
1.	Samyukta Karnataka			
2.	Prajavani			
3.	Kannada Prabha			
4.	Others			

d) Do you read agriculture magazines ? Yes/No

If yes, give details

No.	Name of magazines	Reading behaviour		
		Regular	Occasional	Never
1.				
2.				