HOMESTEAD AGROFORESTRY SYSTEM IN KERALA: FARMERS' PERCEPTION AND ATTITUDE

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CERTIFICATE

This is to certify that thesis entitled *"HOMESTEAD AGROFORESTRY SYSTEM IN KERALA: FARMER'S PERCEPTION AND ATTITUDE"* submitted by Miss. NISHA ARAVIND, for the degree of MASTER OF SCIENCE in AGRICULTURAL EXTENSION to the University of Agricultural Sciences, Bangalore, is a record of research work done by her during the period of her study in this university under my guidance and supervision and the thesis has not previously formed the basis of award of any degree, diploma, associateship, fellowship or other similar titles.

Bangalore

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LIST OF ABBREVIATIONS USED IN THE STUDY

HAF	Homestead Agroforestry
ITDA	Integrated Tribal Development Agency
NAEP	National Agricultural Extension Project
WDP	Watershed Development Programme
MPTS	Multipurpose Tree Species
CPCRI	Central Plantation Crops Research Institute
ICRAF	International Council for Research in Agroforestry
KAU	Kerala Agricultural University
KFRI	Kerala Forest Research Institute

INTRODUCTION

I. INTRODUCTION

We have not inherited this planet from our fore fathers ;

we have borrowed it from our children....

Importance of agriculture is paramount in the context of India's food security and remains the major source of employment and livelihood. Fortunately, since the last two decades we have achieved self sufficiency in food production and recorded all round improvement to boost the crop production . However, to meet the needs of the growing population, we need to increase the food production from the present annual harvest of 193.3 million tonnes to 240 million tonnes, by the turn of the century ; as a sizeable chunk of population is living below the poverty line, food grain production is going to be a centre stage issue. Out of the total land area of 328.8 million ha. 147 million ha is presently under agriculture and there is no chance of bringing additional area under crop production. The only scope for increasing the food grain output is through improving the crop yield per unit area ,by making optimum use of the natural resources and external inputs on a sustainable basis.

This is indeed going to be a Herculean task, particularly because of the fast degradation of land productivity, due to soil erosion and run off. It is estimated that 8.9 million tonnes of mineral nutrients are washed off the fields with 12 billion tonnes of top soil every year in India due to floods, wind velocity, irate rainfall which ultimately leads siltation of dams and irrigation

tanks. Moreover, the continuous increase of CO_2 level in the atmosphere leading to global warming has serious implications for agriculture and environment. Its impact on soil is immediate because soils are the interface between geosphere and biosphere and are the core and buffer of many global changes. Environmental specialists are of the opinion that these environmental hazards are due to excessive deforestation and inadequate soil and water conservation measures. This highlights the need for intensifying our afforestation effort both in agricultural fields and barren lands.

The National Forest Policy, 1988 estimated the total forest area of the India to be 75.18 million hectares, which was about 22.8 per cent of the total geographical area. It is now estimated through landsite imagery, that the forest cover is only 19.5 per cent. (Darivedi and Shukla, 1998). Kerala forest statistics shows the extent of forests as 11,223 sq. km (i.e., 28.88 per cent of land area). Of this 1,823 sq. km were parceled out for non forestry purposes leaving a balance of only 9,400 sq. km (24.19 per cent) of forest as on today.

Hence, natural forests are to be conserved for reasons of environmental priorities and exploited to meet the needs of people and industry, which makes it obligatory to develop forest and tree resources outside natural forests. This important task can be achieved by evolving and implementing more innovative and practical approaches than available at present.

Forestry outside forests will be a new concept in relation to hitherto, recognized precept of traditional forestry which seldom allowed foresters to

think beyond their jurisdiction of legal forests. Forestry or tree cropping needs to adjust itself to be a part of agriculture.

Agroforestry by virtue of its merits has now earned a distinct indentity of its own and hardly needs any elucidation. It is a multidisciplinary, sustainable and integrated land use management system and technology, which increases the overall productivity of the land. Agroforestry land use had two principal objectives viz., sustainability, a term so common in forestry and productivity, a common word in agriculture. The developing countries of the world have to get a balance of the two depending on edapho-climatic situation.

Among the generation old agroforestry systems in the world the home garden agroforestry system claims an outstanding recognition. This highly intensified and well developed indigenous systems are characterized by interactions between abiotic and biotic constituents including the inhabitants housed within these systems. The interactions among constituents; the crops, trees, animal and the human inhabitants are so complex and diverse not only across regions but even within single systems or broad agro-ecological setting.

The productive and protective functions in homesteads are maintained through natural processes, which are not monitored or recorded. However, each system of home garden agroforestry is a reflection of the inter actions between intra- household parameters within a system and its immediate external setting. One of the common factors affecting the diversity is the indigenous knowledge of the people about the species, their uses, compatibility

and complementary benefits of the species. The livable environmental of most of the indigenous home garden systems is quite similar to that of forests, hence its ability to attract numerous seed carriers helps in assuring the sustainability. In fact, while intentional planting brings about 25-30 per cent vegetal cover to the system, the natural processes and the kitchen garbage turns them into a system of dense vegetative cover, rich in bio-diversity, microbial activities and rich in composition. The effect of all these multiple processes on the sustainability of indigenous agro-forestry signifies how random processes stabilize the production systems.

The complementary benefits of the diversity of the traditional systems are related to delivering of inputs to the system and storing of inputs like organic residues and water for its functioning. A number of comparative studies conducted on land use system (Wickramasinghe, 1994) show that among a range of land use system the home garden agroforestry is most desirable for conserving the land resource base. Based on the ability of these systems to increase infiltration, control surface run off, hold moisture, increase soil organic matter and develop soils, the indigenous home garden agroforestry systems are recognized as the most appropriate one to manage the lands which are susceptible to external destruction's.

The thick mantle of organic residues accumulated over decade's recharge the organic matter content of the soil that in turn is attributed to the self-sustainability of the system. Its functions are quite similar to that of the

forest eco-system. The forestry is the foster mother of agriculture and we've to see how best it could be utilized sustainably for improvement of agriculture.

The home garden of Kerala consists of various perennial and annual crops which are intermingled with each other, often without any definite row arrangement and sometimes haphazardly. These systems generally involve livestock rearing and enterprises like apiculture, fish farming etc. Seasonal and annual crops include all vegetables, pulses, tubers, betal vines (*Piper betle*), pineapple (*Ananas comosus*), banana (*Musa paradisiaca*) etc. Perennial crops are major cash crops which include coconut (*Cocos nucifera*), arecanut (*Areca catechu),* pepper (*Piper longum*) ; Coffee (*Cofea arabica*), Cocoa (*Theobroma cacao),* Nutmeg (*Myristica fragrans*) etc. Tree crops are mostly grown to obtain fruits for consumption,shade, timber, ornamental, fodder and green manure purposes. Some of the trees are cashew (*Anacardium oxidentale*), tamarind (*Tamarindus indicus*), Kodumpully (*Garcina cambogia*) etc. The main multi purpose trees are jack (*Artrocarpus heterophyllus*), mango (*Mangifera indica*) etc. Timber trees are teak (*Tectona grandis*) rosewood (*Dalbergia lalifolia*) anjity (*Artrocarpus hirsuta),* mattty *(Ailanthus triphysa)* etc. Fruit trees are guava *(Psidium guajava),* narakom *(Citrus aurantifolia)* etc. Arunamaram *(Polyalthia longifolia).* Chempakam *(Michelia chempaka)* etc. are grouped as ornamental trees. Last group includes medicinal plants, bamboo, fodder, grass and plants raised on tree-fence such as kona (*glyricidia sepium*), kaitha *(Pandanus tectorius)* etc.

The specific objectives of the study are as follows :

1. To study the personal and socio-psychological characteristics of homestead agroforestry farmers.
2. To study farmers' perception and attitude towards homestead agroforestry.
3. To understand the relationship between perception and attitude with their personal and socio-psychological characteristics.
4. To measure the extent of contribution of personal, social-psychological characteristics on perception and attitude of farmers towards homestead agroforestry.
5. To document the crop diversity in homestead gardens and its impact on profitability.
6. To assess the constraints faced by the homestead farmers.

OPERATIONAL DEFINITIONS

Homestead agroforestry

Homestead agroforestry is operationalised as a special type of farming system practiced around the home consisting of multi species of annual and perennial crops along with or without livestock/ poultry for the purpose of meeting the fundamental requirements of the home.

Perception

Perception is the interpretation in terms of usefulness by a farmer about homestead agroforestry based on prior experiences.

Attitude

Attitude is the pre-disposition of an individual towards homestead agro forestry to form either favourableness or unfavourableness towards it.

Statement and significance of the problem

The investigation is unique in its nature where in an attempt has been made to measure the perception and attitude of homestead agroforestry farmers. Forestry outside forests will be a new concept. This new approach of extending forestry beyond its traditional confines will necessitate the government and foresters to shed their seclusive attitude and establish bonds with local people. Holistic understanding of forestry coupled with development of linkages with people will offer an unparalleled opportunity to foresters to properly appreciate the needs of the rural poor and to channelise rural people's energy in to innovative initiatives.

Among agroforestry systems in the world, the homegarden agroforestry system claims an outstanding recognition. Homestead agroforestry is very much prevalent in most parts of Kerala.

Many studies have been conducted regarding agroforestry programmes, but studies related to homestead as a unit of agroforestry is very much lacking. Therefore a beginning is made to know the farmer perception and attitude towards homestead agroforestry system in Kerala.

Further, the information gathered will add to already existing knowledge and understanding of homestead agroforestry , thereby facilitating the researchers to synthesize as well as improve upon their conceptual and theoretical knowledge.

Limitations of the study

The study has the limitations of time and resources usually faced by the student investigator. However, considerable case and thought was excised in making the study as systematic as possible.

It may, however be recognised that the findings of the study should not be generalized beyond the limits of the taluks where the study was conducted. In other words adequate care must be taken to apply the findings of the study to other areas.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

Past studies pave way for future research endeavour. A comprehensive and critical review of the existing literature relevant to the study helps the researcher to design theoretical frame of the study and also to assess the nature and quantum of studies already undertaken in that particular area of research. The reviews presented below under various sub sections are in accordance with the aspects related to the study.

2.1 Homesteads as agroforestry systems.

2.1.1 Conceptualization of agroforestry systems

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2.5 Relationship between personal and socio-psychological characteristics and attitude.

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2.7 Review of Homestead models in the world.

2.1 Homesteads as agroforestry systems

2.1.1 Conceptualization of agroforestry systems

Agroforestry is an age old practice followed in different forms which has recently assumed immense importance. The main theme of agroforestry is optimisation of land use system. It is interdisciplinary approach to systems of land use based on agriculture, forestry, animal husbandry including aquaculture, apiculture land resource management and other disciplines which all form the systematic background of land use.

According to Lundgreen and Raintree (1983) the term agroforestry denotes land use systems consisting of a mixture of perennial and annuals and often also animals. A major concern in agroforestry research is sustainability. It is determined by the structure of the system, its ecological functions and its continued ability to fulfill the socio-economic needs of the people.

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

Cook and Grut (1990) defined agroforestry as the activities which involve the incorporation or retention of trees or shrubs in agricultural or pastoral systems.

A unified definition of agroforestry has been put forward by Tabora (1991) as a sustainable land use system that maintains (sustainability and stability) and increases total yields by combining trees with crops, pasture and animals (productivity) alternately or at the same time (flexibility) using management practices that suit the social and cultural characteristics of the local population (social acceptability) and the ecological conditions of the area (ecological integrity).

Sharma (1996) has conceptualized agroforestry as :-

i) A practice of managing or using land (i.e., a land use system) that combines trees or shrubs with agricultural or horticultural crops or livestock.

ii) A practice which integrates trees with crops and animals with the main objective of reducing risk and increasing total productivity.

iii) Agroforestry systems are both stable and sustainable, such practices have greater diversity than do monoculture practices and can distribute production over a longer period of time.

iv) Sustainability or ability to maintain productivity overtime is also a common feature. Agroforestry systems improve soil physical properties,

maintain soil organic matter and promote nutrient cycling are considered to be strong aspects for sustainability.

v) Integration of trees into agricultural systems provide more efficient use of sunlight, moisture and plant nutrients as compared to monocropping of either agriculture or forestry crops. One of the biological reasons for interest in agroforestry is that trees are portions of biosphere that annual crops generally do not, resulting in increased aggregate biomass production.

Thus agroforestry is a multiple use concept of land management and is capable of meeting the present challenge of shortages of fuel wood, fodder, fibre, timber, unemployment, environmental degradation, protection and improvement of wastelands and agricultural land.

2.1.2 Conceptulization of homestead systems

Nair and Krishnankutty (1985) have opined that the traditional home garden system consisted of several components which were linked together into an integrated whole. At the centre was the household with its land holding. The land use in the home garden was influenced by the crops already existing and the socio-economic situation of the household. The crops existing consisted of different species of trees and shrubs.

Fernandes and Nair (1986) have conceptualized that home gardens (also known as homestead and mixed gardens and compound farms) were

usually located, where they exist at all, close to the household as one of the more intensively cultivated parts of the overall farm. They are characterized by a mixture of several or many annual or perennial species found in association and commonly exhibited, a layer of vertical structure of trees, shrubs and ground cover plants which recreated some of the properties of nutrient cycling, soil protection and effective use of species above and below the soil surface to be found in forests.

Soemwarto (1987) has interpreted home garden as a system for the production of subsistence crops for the gardener and his family. It may or may not have the additional role of production of cash crops. It can be immediately surrounding the home or slightly further away, but still near the residential area.

Nair (1989) has opined that in different areas with identical agro-climatic conditions, factors such as human population pressure, availability of labour and other production resources, proximity and accessibility to market sources etc. were the main determinants of the types and forms of agroforestry systems. A typical example in the spread of multi species, multi storeyed home garden systems. Though found mostly in humid low lands, home gardens were common in pockets of high population density and in other ecological regions also. The compound gardens of Nigeria, the homestead agroforestry in Kerala, multi storied garden systems of Java and Sumatra, the Chagga homesteads of

Tanzania, Kandy gardens of Sri Lanka are some of the typical examples of homestead agroforestry systems.

Nair and Sreedharan (1989) have defined homestead as an operational farm unit in which a number of crops were grown in conjunction with livestock, poultry and / or fish mainly for the purpose of satisfying the farmer's basic needs. The components were so intimately mixed in horizontal and vertical strata as well as in time that complex interactions existing between the soil, plants, other components and environmental factors in the farmers plot.

The farmers chose his crops and crop combinations based on his own wisdom and perceptions acquired over generations of experience. The criterion being his home requirements of food, fuel, fodder and timber.

Salam *et al.* (1992) defined homegarden agroforestry as a special production system with tremendous structural and functional diversity. There was a multitude of annual and perennial crops grown along with livestock, poultry and fish to meet the requirement of food, fodder, fuel and timber and generate some additional income through sale of surplus. The home gardens of Kerala are traditional agroforestry systems in which perennial and annual crops are grown intermingled often without any definite row arrangement and sometimes haphazardly.

According to Skutch (1994), the home gardens in Sri Lanka represented an enormous wealth not only in terms of bio-diversity but also in terms of indigenous technical knowledge.

Hence, homestead agroforestry can be defined as a special type of farming system consisting of multiple species of annual and perennial crops along with or without livestock / poultry for the purpose of meeting the fundamental requirements of home.

2.1.3 Origin of homestead systems

Hutterer (1984) has opined that home gardens may have originated in pre-historic times when hunters and gatherers deliberately or accidentally dispersed seeds of highly valued fruit trees in the vicinity of their camp Soemarwoto (1987) also affirmed the opinion.

Ninez (1984) has pointed out the description of the mythical Garden of Eden in Genesis II was that of a home garden, containing "every tree that is pleasant to sight and good for food". The area from which this description was drawn, the early Mediterranean, was but one region which has long formed an important component of agriculture.

Brownrigg (1985) in his literature review, mentioned that home gardens in the Near Eastern region were documented in paintings, papyrus, illustration and texts dating to the third millennium BC. They were attached to temples, palaces, elite residences and the houses of the rich.

Arnold (1987) reported that home gardens had long existed as the principle farming systems on dryland accounting for a substantial proportion of

land use, with irrigated rice cultivation forming the other main component of the farm system.

2.1.4 Species Diversity of Homestead systems

A number of studies and surveys have been conducted all over the world's tropical home gardens revealing the structural diversity of homesteads based on agro-ecological peculiarities and human and social needs. A few studies are reviewed here.

Anonymous (1989) reported that ICRAF survey findings on adoption and impact of the agroforestry technologies under Kenya's agroforestry extension project, provided insights into agroforestry adoption patterns in a mixed crop livestock small holder system under intense population pressure. Home compounds were the most important site for tree growing and showed the greatest species diversity. There was also a clear increase in number of trees planted in crop land especially in areas of relatively high rainfall and population density. Altogether 178 tree species were found on farms covered by survey. Only 9 species were considered by more than half of farmers to grown well together with crops. These include indigenous species *Markhamia lutea, Sesbania sesban* and *Croton megalocarpus* and introduced species *Leucaena leucocephala, Grevillea robusta, Callindra calothyrsus, Samanea samam, Persea americana* and *Carica papaya.*

Allen (1990) found that 85 per cent of all homestead of Sigomkeni and 73 per cent in Bhekinkhogi had planted at least one tree in common. Other forms of planting included small wood lots, fruit trees and ornamentals wood lots consisted of two introduced wattle species *Acacia mearnsii* and *Acacia decurrens*. Most commonly planted fruit trees were Avocado, Banana, Peach etc. No complex labour or intensive agroforestry practices were observed.

Darwiss (1990) reported that the coconut farming systems adopted by Indonesian small holders could be classified into four types ; farmyard manure, polyculture, monoculture and tidal swamp. In the polyculture type system coconuts may be grown with annual, perennial or both types of intercrop. In Java, 78.7 per cent of the coconut small holdings fall within the polyculture pattern and the remaining as monoculture.

Salam *et al.* (1992) observed that homegardens of Kerala were traditional agroforestry system in which perennial and annual crops were grown intermingled often without any definite arrangement. Common annual crops associated with these system were rice, fingermillet, urd bean, mungbean, horsegram, pigeon pea, cowpea, tapioca, sweet potato, colocasia, elephant, footyams, dioscorea, banana, papaya, pineapple, brinjal, tomato, amaranthus, okra, bittergourd, bottle gourd, snake gourd, ridge gourd, ashgourd, little gourd, cluster bean, sesamum, groudnut, ginger, turmeric and chilli . Perennial crops included coconut, arecanut, rubber, jack, mango, cashew, guava, sapota, breadfruit, tamarind, drumstick, clove, pepper, nutmeg,

cinnamon, coffee, cocoa, betelvine. Guinea grass and napier grass were commonly grown in interspaces of perennial crops. In addition to these many useful trees like teak, neem, bamboo, albizia, ailanthus etc were there.

Shehana *et al.* (1992) reported that the spice components helped to enhance the bio resource diversity and on farm resource diversity utilization in homesteads. The crop components were grown in a polyculture that consisted of distinct canopy stratification. Thus, crops like coconut, arecanut, jack, mango etc. occupied top most layer. Pepper, cashew, clove, nutmeg, cinnamon etc. second layer. Banana, cassava, yam etc. third layer while ground layer was occupied by ginger, turmeric, pineapple, vegetables etc. Structural arrangement of components were designed to ensure high degree of natural resource utilization in space and time.

Jensen (1993) pointed out that 0.31 ha home gardens in West Java contained about 60 plant species (excluding weeds) of which 39 supplied useful products and those remaining were ornamentals. Tree coverage was 81 per cent and total ground cover, including ground litter and weeds was 99 per cent. The vegetation was multi-layered . Total biomass was estimated as 126 t/ha, including 4.4 t/ha of ground litter. Of the total biomass, 95 per cent belonged to tree compartment ; *Cocos nucifera, Syzygium aromaticum* and *Lansium domesticum* alone constituted 75 per cent. The homegarden resembled both in structure and biomass.

Mammen *et al.* (1993) reported about species diversity in homesteads of Kerala. This include seasonal and annual crops which included all vegetables, pulses, tubers, betelvines (*Piper betle*), pineapple *(Ananas comosus),* banana (*Musa paradisiaca*) etc. Duration of these crops was less than one year. Perennial crops were the major cash crops which included coconut (*Cocos nucifera*), arecanut *(Areca catechu),* pepper (*Piper longum*),d coffee (*Cofea arabica*), cocoa (*Theobroma cacao*), nutmeg (*Myristica fragrans*) etc. Tree crops were defined as all trees other than those considered as perennial crops. Most tree crops were grown to obtain fruits for consumption, shade, timber, ornamental purposes, fodder and green manure. Some other trees that provided income through sale of produce are cashew (*Anacardium occidentale*), tamarind (*Tamarindus indica*), kudampuly (*Garcinia cambogia*) etc. Main multi purpose trees retained for their wood and fruit values were jack (*Anacardium oxidentale*), mango (*Mangifera indica*), timber trees were teak (*Tectona grandis*), rosewood (*Dalbergia lalifolia*), anjily (Ar*trocarpus hirsuta*), matty (*Ailanthus triphysa*) etc. Fruit trees were custard apple (*Anona squamosa),* guava (*Psidium guajava*), narakom (*Citrus* spp.), muringa (*Moringa oleifera*) etc. Arunamaram (*Polyalthia longifolia*), chempakom (*Michelia chempaka*) were grouped as ornamental trees. Miscellaneous crops included bamboo, fodder grass, and plants raised as live fence such as konna (Gliricidia sepium), kaitha (*Pandanus tectorius*) etc.

Dhillon (1994) pointed out that farmers in the foot hills of Shivaliks retained trees like *Dalbergia sisoo* (sissoo), *Acacia sp.*(kikar), *Azadiracta indica* (neem), *Prosopis cineraria* (khejri), *Capparis decidua* (karir), *Cordia dichotoma* (lasoora), *Morus alba* (tut), *Albizia lebbeck* (siris), *Butea monosperma* (dhak), *Tamaris articulata* (farumah), *Zizyphus jujube* (ber) and *Salvadora oleoides* in their cultivated fields. There were many local bushes that bring about soil conservation. Traditional rainfed crops like wheat and maize were cultivated in the fields.

Kumar *et al.* (1994) based on their survey conducted in 17 selected taluks of Kerala reported that there was tremendous variability both in number of trees and shrubs present. All sized holdings also exhibited profound variability in the number of woody taxa and individuals present. In total 127 woody species were encountered. Floristic diversity was higher in smaller homesteads and decreased with increasing size of holdings. No clear cut planting pattern was discernible in the home gardens. Trees and shrubs were either scattered throughout the homestead or on farm boundaries. Farmers tended to prefer timber trees such as ailanthus (*Ailanthus trypsa* highest, frequency) and teak (*Tectana grandis*), and fruit trees such as mango (*Mangifera indica*), jack (*Artrocarpus heterophyllus*) and cashew (*Anacardium occidentale*), palms, however constituted the dominant component of both standing commercial timber and fuel wood volumes, accounting for as much as 63 per cent and 72 per cent, respectively of the total wood in these categories.

Reddy and Avinash (1994) reported on the species diversity in coconut gardens of Tiptur region in Karnataka. According to them most common species found were *Azadiracta indica, Pongamia glabra, Artrocarpus heterophyllus, Acacia nilotica; Albizia lebbeck, Madhuca indica, Mangifera indica, Tamarindus indica, Syzygium cumini, Ficus sp., Tectona grandis, Acras sapota, Dalbergia sp. Musa sp. Areca catechu, Psidium guajava* etc. Common species for live hedges were *Agave sp. Euphorbia sp. Lantana camera* and *Ipomea sp.* Normally they were interspersed with *Acasia nilotica* and *Pongamia glabra.*

Wickramasinghe (1994) reported that Kandy gardens which represented traditional home gardens practiced on small holdings of 1 ha. in Sri Lanka had varying species diversity with total number of trees and shrubs varying from 65 to as many as 1700 / ha. with a multistorey configuration shrubs which included different species of fruits trees, medicinal plants and timber species where in components were arranged randomly in space.

2.1.5 Functional diversity and advantages of homestead agroforestry system

Homegardens or homestead systems are raised to perform a variety of roles and fulfill various functions of the farm family and the community therein. The functional basis of homesteads has been defined by Nair (1989) as the major function or role of the system, which may be productive eg.

production of food, fodder, firewood and so on or protective eg. windbreak, shelter belt, soil conservation and so on.

Frenandes and Nair (1986) revealed that multistorey tree gardens were highly productive, fully sustainable and very practicable systems. The soil fertility maintenance was achieved by combination of inputs, particularly of household waste and a high level of recycling of organic matter and nutrients.

Salam *et al.* (1992) found that a variety of tree species commonly grown in the homesteads for meeting the food, fodder, fuel and timber requirements of the home and have been effectively utilized to trail pepper. This practice not only enhanced the productivity of the system but also increased the resource efficiency of homesteads.

Shehana *et al.* (1992) pointed out that spice components helped to enhance the bio-resource diversity and on-farm resource diversity utilization in homesteads. The crop components were grown in a polyculture that consisted of distinct canopy stratification. This helped to reduce soil temperature inside the micro climate which inturn helped to reduce soil evaporation rate. The litter and crop residues were often left to get accumulated in soil and this was helpful to reduce soil evaporation rate. The litter and crop residues were often left to get accumulated in soil and this was helpful in building up the organic matter content of soil.

Jensen (1993) concluded that sustainability of the homegarden was connected with the medium fertile soil with large nutrient reserves, the large

plant biomass directly and indirectly protected the soil against erosion and drying, and a high species diversity provided a large variation in crop phenology and stability in nutritional supply.

Gupta and Rao (1994) stated that the extent of global warming could be reduced by preventing deforestation and managing soils from continuing to be source of green house gases. Soil carbon management strategies revolve around.

a) Managing soil carbon pools by maintaining soil fertility, preserving natural wet lands and increasing efficiency of forest produce use.
b) Restoring carbon in depleted soils by reforestation planting of Nitrogen fixing trees.
c) By managing forest and agricultural systems in ways that increase their productivity and their allocation in storage carbon below ground. For example through various agroforestry intervention.

Zhaohua (1994) stated the principle of food chain to design effective agroforestry was very important and very common now. In agroforestry system, there were three main components plants (producer) animals (consumer) and micro organism (decomposer and reducer). Therefore a food chain component formed between these components. It was very important for keeping high productivity of a system to appropriately control the relationship between the components so to form a good cycle in which the components depend on and improve each other.

Ravindranath *et al.* (1995) found that a high per cent of farmers maintained large diversity of trees which yield multiple benefits, eg. like karanj (leaf manure, oil seeds and twigs of fuel), neem (leaves as fodder, oil seeds, tinsher, twigs as fuel wood, agricultural implements) and ficus species (leaves as fodder, twigs as fuel and trunk as timber) on their farm.

Girish (1996) reported that agroforestry systems had several advantages like (a) Maximise production i.e., by greater efficiency of perennial crops for photosynthesis and by tapping water and nutrients from deeper layers, moreover this created better environmental conditions for growth of annual crops. (b) supplement food and fodder (c) meet diverse needs of people eg. food, fruit, fuelwood, timber, fodder, fibre oil, medicines, gums, resins, tannins etc. Trees yielded almost everything which man needs (d) improved soil by reduction of soil erosion, addition of carbon and its transformations through leaf twig, bark falls etc, enriching nitrogen by N_2 fixing trees shrubs etc. Improvement of physical condition of soil such as water holding capacity, permeability etc. (e) release and recycling of nutrients by affecting biochemical nutrient recycling (f) creating more favourable micro climate by wind break, shelter belts and lowering effect of water table in areas where water table is high. Thus it increased farm income and improved environment.

Sharma (1996) pointed out that there was a long standing tradition of practicing coconut based system in Kerala. An important aspect was the

presence of more plant cover on the plantation floor increased the fixation of nutrients that is cycled within the soil plant system.

The vegetative cover maintained reduced soil erosion risks, biotic diversity of species composition, age distribution, trophic levels and so on was sustained above the level at which the activities of pets and diseases become an ecological and economic constraint. Previous experience have shown that large scale plantations restore forest coverage and achieve objective of sustainability, increased production which benefit the farmers as well as rural poor.

Singh (1997) pointed out that species in agroforestry yields extended range of products viz., food, fodder, fuel, fibre, fertilizer etc, helped in utilization of off season precipitation, helped in soil and water conservation, imparted stability and resulted in risk reduction of two or more components of system i.e., even if one fails other would give harvest. Agroforestry system checked the rise in soil temperature, thus profited soil micro organism which are of great benefit in crop production ; moreover it helped in recycling of nutrients from lower soil horizons as deep rooted nature of most trees resulted in tapping of nutrients from deeper layer and returning it to plough layer by leaf drop and litter, hence the tree component improved the micro climate of whole system. Thus agroforestry results in improving and stabilizing the income of farmers.

2.1.6 Constraints encountered while practicing agro forestry

Research studies pertaining to the constraints encountered in practicing agroforestry were reviewed and are presented.

Anonymous (1991) reported several production problems. They are:

1. Shortage of good planting material fruit species wanted by the farmers.
2. Fruit crop husbandry research should develop prototype combinations of fruit species with food crops and other multi-purpose trees.
3. Small farm size created problems like competition with food crops.
4. Marketing problems included transport and pricing.
5. Pests and diseases.

Umale *et al.* (1991) reported that most of the farmers were found to be deficient in knowledge about the trees recommended under agroforestry and their cultivation practices. They were also found to be not adopting the recommended technologies of agroforestry to a desired extent. A considerable per cent of the respondents reported that due to incomplete knowledge of recommended technologies of agroforestry they could not adopt the same. Study revealed that sufficient literature in local language was not available with regard to package of practices of agroforestry.

Rai and Shivashankar (1993) conducted a survey on agroforestry practices in Karnataka. According to the them, the important constraints due to which people have not taken up agroforestry were :

1. Not enough land (23.6 per cent)
2. Lack of technical knowledge about planting trees (18.5 per cent)
3. Lack of water (17.9 per cent)
4. Long gestation period (13.2 per cent) and lowering down of water table by trees

Viswanath *et al.* (1994) reported that the major constraints in tree farming were :- (a) Stray grazing (b) erratic rainfall pattern and lack of proper irrigation facilities (c) non-availability of inputs like superior planting stock (d) lack of finance / capital (e) inadequate marketing infrastructure to take up commercial tree planting of multipurpose tree species and low level of awareness regarding the profitability of several multipurpose tree species.

Michael (1995) reported most commonly mentioned constraints were lack of water, lack of planting stock, lack of seedlings and lack of time and interest by farmers as well as lack of experience.

Pawar and Kadam (1995) in his study brought out the constraints faced by the agroforestry growers which were coming in the way of expansion of agroforestry systems. The shortage of seedlings was very acute in case of teak. Non co-operation from the government officials and uneconomical transport facilities were also the obstacles in expansion of the plantation. About 23 per cent of agroforestry growers pointed out the difficulty of interculturing in tree plantation. Near about 21 per cent of the plantation growers complained about high mortality of seedlings especially in teak, more than 4 per cent of growers

expressed their dissatisfaction towards the existing marketing structure. 20 per cent reported lack of proper market information. Rigidity of government rules in respect of disposal of teak wood was very troublesome to about 43 per cent of teak growers. In addition to these constraints the agroforestry growers expressed other constraints such as delayed returns, tree serving as host of pests and diseases.

Patnaik (1996) reported that the major bottlenecks in marketing of homestead produce were lack of market infrastructure, marketing plan, lack of proper planning of produce manufacturing system and produce disposal system. In addition to this the stringent act and rules for removal of forest produce even from the private land holdings and lack of agencies to facilitate the marketing were perhaps the major stumbling blocks.

2.1.7 Homestead systems of Kerala

On the basis of literature reviewed on constraints involved in practicing of agroforestry practices, it could be inferred that a host of constraints were operating. The most cited constraints are related with institutional, economical and infrastructure.

Nair and Sreedharan (1989) have discussed on the homesteads system in Kerala. Because of the high density of population, the size of land holding was very small, commonly ranging from 0.02 ha to 1.00 ha. The farmers of Kerala usually undertake intensive farming with a variety of crops on the limited area

available in order to obtain food, fuel, fodder, timber and cash from the homesteads.

On an average, each household consisted of 6-8 people who provide the necessary workforce. In the small holdings, planting, cultural operations and harvesting of different crops occur throughout the year and were attended by farm family. Most crops in the homesteads are labour intensive except coconut. The average requirement of labour on one hectare homegarden with an intensive crop mix and livestock was about 1000 man days per year as compared to 150 man days for coconut monocropping and 400 man days for rice monocropping.

The multiple of crop species in the homesteads also helped to conserve the fertility by nutrient cycling yielding in spite of high intensity of cropping. The increased microbial activity in the rhizosphere of crops was another positive contribution in the multicropping system. Mixed farming also led to substantial improvements in the physical and biological characteristics of the soil. The use of waste materials for feeding cattle, poultry and fish resulted in efficient recycling of these wastes, whereas increased utilization of family labour in this enterprise reduced expenditure on hired labour. Adoption of mixed farming practices in root disease affected areas had helped to enhance the productivity of the coconut palms as well as of land. The homestead system also prevented exposure of the bare soil to the beating action of the torrential

rains experienced in parts of Kerala and consequentially led to the reduction in soil erosion.

As described by Anonymous (1989), a typical homestead in Kerala consisted of a dwelling house with a small garden in front and a variety of annual and perennial crops grown in mixture in a small piece of land. The crops of homestead may include vegetables, a few coconut and / or arecanut palms, tapioca, banana, drumstick, tree species, papaya, jack, mango and other fruit trees. In addition to these, the presence of one or two heard of livestock (cows, goat or buffaloes) with a small unit of poultry was another notable feature. More than 80 per cent of the produce generated was consumed in the home itself and the remaining 20 per cent provide subsidiary income to the household. Over years of experience, these homesteads have evolved into self sustaining and productive farming systems. Optimum utilization of available land, solar energy and technological inputs and efficient recycling of farm wastes are the important characteristics of this system.

Salam *et al.* (1991), based on the crop–livestock components and interactions in the homesteads, have attempted to evolve a homestead model for rainfed farming in the coastal uplands of South Kerala. Another study on pepper associated agroforestry systems in the homesteads of Kerala conducted by Salam *et al.* (1992) listed atleast 31 tree species in homesteads of Kerala which can be successfully used for trailing pepper. Along with the most common coconut based multi-tier cropping system, tree crops like arecanut,

jack, mango, cashew, tamarind, teak etc. were also grown in the homesteads for meeting different requirements of the home as well as trailing pepper. Pepper associated agroforestry of the homesteads of Kerala not only meets the food, fodder, fuel and timber requirements of the home but also meets the ornamental and medicinal purposes.

2.2 Farmers perception towards Homestead agroforestry

The meaning of perception as given in Webster's New Twentieth Century Dictionary (1978) is that, perception means the action of the mind by which it refers its sensations to an external object as their cause.

Perception differs from person to person and is a dynamic phenomenon in nature and changes occur over a period of time. Our perceived responses are generally, influence of internal and external factors.

In general the perception studies help in understanding of human behaviour hence some of the studies pertaining to perception of farmers towards agroforestry, social forestry etc. are reviewed here.

Heilin (1989) reported that more than half of the farmers had perceived the principles of agroforestry like possibility of getting poles and leaves. 38 per cent had perceived the importance of trees as wind break and 15 per cent had perceived the trees over soil erosion and protection.

Langewar and Shirke (1991) studied that perception of farmers of Nagpur district towards social forestry. Regarding the importance of social

forestry majority of the respondents perceived it as important since 'it helped to use the wastelands (93.33 per cent),' ' helped the farmers earn money with less labour (80.66 per cent)', 'helped the farmers in getting small timber and poles (77.77 per cent),' 71.10 per cent of farmers perceived it important because it was easy to supervise and less labour intensive.

Seema (1993) reported differential perception of utility of message on wasteland technology by rural women and the scientists. The study also revealed a differential perception with respect to utility of messages on production of clean milk and vaccination of animals by rural women and scientists and non-differential perception with respect to utility of message on balance feeding care of animal shed and detection of heat in animals.

Sombatpanit *et al.* (1993) found that more progressive farmers had better perceptions of the causes and effects of land degradation and how to apply corrective measures.

Venkataprabhu (1993) studied perception pattern and principles of agroforestry by differential group of farmers. The study revealed that (I) the principles namely meeting fodders, fuel, fertilizer 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 with a varied magnitudes, (ii) the perceived importance of agro-forestry, comprises the following, suitability

of trees, less requirement of inputs like fertilizers, pesticides and manures, suitability for waste / barren / follow lands, realisation of more income with less investment and a supporting role for crop / livestock enterprises by all the categories of farmers to varied degrees.

Dhillon (1994) reported that farmers of Punjab had better perception towards trees which can supplement their income. Therefore fast growing trees which can bring early and lucrative returns are preferred.

Sangappa (1996) studied the perception of usefulness of agroforestry practices. The study revealed that ;

i) About 63 per cent and 37 per cent of adopters of planting trees along the irrigation canal practice perceived it usefulness in reducing erosion of irrigation canal and provided economic profit respectively. Establishment of live bunds practice was perceived as useful by 61 per cent, 22 per cent and 17 per cent of adopters perceived it as useful for reducing soil erosion, helped for water conservation on and provided fodder for cattle respectively.

ii) Practice of planting trees in rows was perceived as useful for the reasons more economical do not come in the way of cultural operations protected agricultural crops from heavy winds and increased soil moisture, soil fertility and economic use of less fertile and waste lands respectively.

On the basis of studies reviewed on perception pattern, it could be inferred that there exists variation in perception pattern of people about the objects since perception is a dynamic phenomenon.

2.3 Farmers attitude towards homestead agroforestry

Thurstone (1946) defined attitude as the degree of positive or negative effect, associated with some psychological object. It may be any symbol, phrase, slogan, person, institution, idea towards people can differ with respect to positive or negative effect.

New comb (1950) speaks attitude as state of readiness for motive arousal and an individuals towards something is his pre disposition to perform perceive pink and feel in relation to it.

Man possess attitude towards a wide range of phenomenon as Krech and Crutchfield (1948) had pointed out, it is valence and degree of multiplicity of attitude that decide the influence of attitude of behaviour at a given point of time. When the attitude of a person is know, it is possible to indicate his probable reaction to certain stimuli.

Since, detailed studies of attitude of farmers towards agro-forestry were not available, this variable has been included in the present study.

Thomas and McClean (1984) in their study in England reported that 62 per cent of respondents were found to have favourable attitude towards

forestry. 38 per cent had an unfavourable attitude and 8 per cent were undecided in their opinion.

Dixit (1988) found majority of the respondents (66 per cent) had a favourable attitude, towards the social and farm forestry programmes

Singh (1991) found in Warangal district of Andhra Pradesh that 55 per cent of farmers had favourable attitude and 45 per cent had highly favourable attitude towards social forestry programme.

Jambhale *et al.* (1992) reported that majority of farmers believed that trees can be grown with crops without serious losses to crop production.

Samuel and Ilango (1992) found that majority of the beneficiaries of Andhra Pradesh (65 per cent) were satisfied with social forestry scheme. Majority of the beneficiaries felt that their social status had improved through the social forestry programme.

Rafi (1993) pointed out that 85 per cent of participant farmer had favourable attitude towards farm forestry and 69 per cent of non-participants had unfavourable attitude towards farm forestry. In general, 57 per cent had favourable attitude towards farm forestry.

Hareesha (1994) reported that 56 per cent of farmers had less favourable attitude towards the ill effects of using agricultural chemicals while 44 per cent had unfavourable attitude.

Viswanath *et al.* (1994) revealed subtle change in the attitude of farmers towards tree planting preferences. Farmers were more inclined to go for

eucalyptus for bund planting to meet fuel and small timber needs. A majority of them felt that eucalyptus would provide quick economic returns not withstanding the longterm ecological implications in rainfed agro eco systems.

Natarajan and Muthaiah (1995) found that large majority (73.33 %) of the farmers had favourable attitude, while 17.5 % and 9.17 % of theme had less favourable and more favourable attitude respectively towards social forestry programme.

Rocheleau *et al.* (1998) found that farmers had a favourable attitude towards homegardens as it produce in a green vegetable for home consumption and these vegetables were more palatable and easier to prepare than the usual mix of gathered green.

Thus, it could be inferred from the above reviews that there exists variation in the attitude of respondents towards the objects in question. It can also be inferred that in majority of the studies cited above, respondents had a more favourable attitude followed by favourable and less favourable attitude.

2.4 Relationship between personal and socio-psychological characteristics of farmers and their perception

Studies pertaining to relationship between characteristics of farmers and perception on agroforestry were not reported hence, an attempt has been made here to review the related literature on selected topic.

2.4.1 Age and perception

Sudheendra (1986) reported that age was found to be non-significantly associated with perception regarding adoption pattern of sunflower among sunflower growers.

Nimbalkar and Pawar (1990) found that age had non-significant relationship with the perception of televiewers towards farm programmes.

Ratnakar and Reddy (1991) cited that age had non-significant correlation with perception regarding ITDA programme among Tribal farmers of Andhra Pradesh.

Patil (1994) found that perception of NAEP by the farmers was non-significantly related with age.

Arulraj and Ulagalandan (1995) observed that age exhibited negative and non-significant correlation with perception regarding early planting of sugarcane among sugarcane growers.

Padmaiah (1995) reported that age had negative and non-significant relationship with the perception of usefulness of watershed development programme by respondents of watershed area.

In most of the studies listed above it may be concluded that age of the respondents had no relationship with perception of farmers.

2.4.2 Education and Perception

Sudheendra (1986) found that there was non-significant relation between education and perception about adoption pattern of sunflower.

Nimbalkar and Pawar (1990) reported that education was found to be non-significantly associated with perception regarding farm programme among televiewers.

Ratnakar and Reddy (1991) found that there was significant relationship between education and perception of farmers towards ITDA programme.

Arulraj and Ulagalandan (1995) found that education exhibited a non-significant correlation with perception regarding early planting of sugarcane.

Padmaiah (1995) reported that education exhibited significant correlation with perception of usefulness of WDP by respondents in watershed area.

Padmaiah and Ansari (1997) pointed that education exhibited a positive and significant relationship with perception about usefulness of WDP.

In the light of above studies, it is worth including education as a variable and find its impact on perception.

2.4.3 Land holding and perception

Sudheendra (1986) reported that land holding was found to be non-significantly associated with perception regarding the adoption pattern of sunflower.

Nimbalkar and Pawar (1990) found that land holding had non-significant relationship with the perception of televiewers towards farm programmes among.

Ratnakar and Reddy (1991) pointed out that land holding had non-significant correlation with perception regarding ITDA programme among tribal farmers.

Patel and Patel (1993) cited that farm size had a non-significant relation with perception regarding lab to land programme.

Patil (1994) found that farm size was significantly related with perception regarding NAEP as to usefulness among farmers.

Arulraj and Ulagalandan (1995) reported that there was significant correlation between land holding and perception regarding early planting of sugarcane among sugarcane growers.

Padmaiah (1995) in his study observed that land holding had no significant association with perception of the usefulness of WDP.

Most of the studies reviewed above, revealed that land holding of farmers had no relationship with perception. Two studies mentioned above reported significant relationship. Hence, in this study also it is assumed that land holding and perception may be related.

2.4.4 Annual income and perception

Nimbalkar and Pawar (1990) reported that annual income had a non-significant relationship with perception towards farm programmes among televiewers.

Nagpal and Yadav (1991) reported that annual income had non-significant relationship with perception.

Patil (1994) found that annual income had a negative non-significant relation with perception of NAEP as to the usefulness by farmers of transitional and dry zone and had positively significant association with perception among farmers of irrigated and pooled zone.

Padmaiah (1995) indicated that income did not exert any significant relation with the perception of usefulness of WDP.

From the above studies it could be inferred that annual income had no relationship with perception.

2.4.5 Extension contact and perception

Sudheedhra (1986) found that extension contact had a non-significant association with the perception towards adoption pattern of sunflower among sunflower growers.

Ratnakar and Reddy (1991) reported that there was significant correlation between extension contact and perception among beneficiaries of

ITDA programme and non-significant relation between extension contact and perception among non-beneficiaries.

Patil (1994) found significant correlation between extension contact and perception of usefulness of NAEP among Dharwad farmers.

Arulraj and Ulagalandan (1995) reported that extension contact had a positive significant relationship with the perception about early planting of sugarcane.

Padmaiah (1995) cited that extension contact exerted positively significant relation with perception of usefulness of WDP by respondents.

It is quite interesting to find out that majority of the studies mentioned above pointed out that higher extension contact accompanies higher perception.

2.4.6 Mass media and perception

Sudheendra (1986) reported that mass media was found to be non-significantly associated with perception regarding the adoption pattern of sunflower.

Nimbalkar and Pawar (1990) reported that mass media contact had a significant association with perception towards farm programmes among televiewers.

Ratnakar and Reddy (1991) reported that mass media contact has no significant association with perception among beneficiaries of ITDA programme.

Patil (1994) cited that there was significant correlation between mass media contact and perception of usefulness of NAEP among farmers.

Arulraj and Ulagalandan (1995) pointed out that there was no correlation between mass media contact and perception regarding early planting of sugarcane.

Padmaiah (1995) reported that mass media contact did not exhibit any relationship with the perception of usefulness of WDP.

From these studies it could be inferred that mass media had some influence on perception of farmers.

2.4.7 Cosmopoliteness and perception

Viju and Pillai (1988) found that there was no significant association between cosmopoliteness and perception.

Ratnakar and Reddy, (1991) reported that there was significant association between cosmopoliteness and perception.

2.4.8 Scientific orientation and perception

Ingle and Virkhare (1988) reported that scientific orientation was positively correlated with perception of utility regarding readability of printed farm advertisements.

2.4.9 Credit orientation and perception

Patil (1994) reported that credit orientation had non-significant relation with the perception of farmers of Transitional zone towards usefulness of NAEP and negatively and significantly related with farmers perception in dry zone. While among hilly, irrigated and pooled zone farmers, credit orientation had a positive significant relationship with their perception.

Padmaiah (1995) reported that credit orientation exhibits positive and significant correlation with the perception of usefulness of WDP by the respondents of watershed area.

2.5 Relationship between personal, socio-psychological characteristics of farmers and their attitude level.

2.5.1 Age and Attitude

Digraskar *et al.* (1992) conducted a survey in Parbhani district of Maharashtra and revealed that age of the biogas users had non-significant association with their attitude.

Nagpal and Yadav (1991) reported that age had significant association with attitude towards biogas plant.

Ruju *et al.* (1994) reported that age did not show significant relationship with the attitude of respondents towards seed supplying agencies.

Nimbal (1995) found that age did not exhibit significant relationship with the attitude of respondents towards biogas plants.

Surekha *et al.* (1997) in their study revealed that there was no significant relationship between farmers attitude and their age regarding the adoption of water shed development activities.

In most of the studies mentioned above age depicted a negative relationship with perception.

2.5.2 Education and Attitude

Dixit (1988) reported positive significant association between education and attitude of the beneficiaries towards social forestry and farm forestry programmes.

Meti (1990) found significant association between attitude and education.

Digraskar and Wangikar (1990-91) conducted a study in Parbhani district of Maharashtra and they have found non-significant association between education and attitude of biogas users.

Nagpal and Yadav (1991) found that education was significantly associated with attitude of biogas users.

Ingole and Ingle (1992) found that there was no significant association between education and attitude of respondents towards farm telecast.

Rafi (1993) in his study found that education had significant influence on attitude of farmers towards farm forestry.

Naik (1994) cited that there was a positive and significant relationship between formal education and attitude of respondents towards seed supplying agencies.

Nimbal (1995) reported that there was a positive and significant relationship between formal education and attitude of farmers towards biogas technology.

Surekha *et al.* (1997) in their study depicted that there was a significant relationship between education and farmer's attitude towards watershed development programme.

Nagabhushanam *et al.* (1998) found that education had significant relationship with attitude developed towards institutional training programme.

It is quite interesting to note that all studies except two mentioned above revealed that education was significantly related with attitude of farmers.

2.5.3 Land holding and attitude

Dixit (1988) in his study found that land holding of farmers was significantly associated with the attitude of farmers towards social and farm forestry programmes.

Meti (1990) reported that land holding of the respondents had non-significant association with attitude.

Digraskar and Wangikar (1990-91) reported that land holding of the plant users had non-significant association with attitude.

Nagpal and Yadav (1991) reported that size of land holding was non-significantly associated with attitude of gas plant users.

Naik (1994) reported that there was significant association between land holding and attitude of respondents towards seed supplying agencies.

Nimbal (1995) observed that there was positive and significant relationship between land holding and attitude of the respondents.

Surekha *et al.* (1997) reported that there was significant relationship between farmers attitude and size of land holding.

All recent studies except three have pointed out significant association of land holding with attitude.

2.5.4 Annual income and attitude

Digraskar *et al.* (1992) found non-significant association between income level attitude of biogas users.

Naik (1994) reported that there was positive and significant relationship between income level and attitude.

Nimbal (1995) found that there was positive and significant relationship between income level and attitude.

From these studies it could be inferred that income had some influence on attitude.

2.5.5 Social participation and attitude

Dixit (1988) found that social participation was not significantly associated with the attitude of farmers as the participation was only upto low and medium level.

2.5.6 Extension contact and attitude

Dixit (1988) found that extension contact was significantly associated with the attitude of farmers towards social and farm forestry programme.

Swamy (1988) reported that there was significant association between extension contact and attitude of farmers towards NAEP.

Hareesha (1994) reported that extension contact of farmers with the extension personnel of development departments was found to be non significantly associated with their attitude.

From studies mentioned above, it can be understood that extension contact has got positive influence on attitude of farmer.

2.5.7 Mass media and Attitude

Dixit (1988) found that mass media participation of respondents was not found to be associated with their attitude.

Swamy (1988) reported significant association between Mass media contact and attitude of farmers towards NAEP.

Nagpal and Yadav (1991) reported that there was significant association between mass media participation and attitude of biogas users.

Nimbal (1995) observed that the relationship between mass media participation and attitude of the respondents towards biogas plant was highly significant.

Surekha *et al.* (1997) reported that there was significant association between mass media and attitude towards watershed development programme.

It is quite interesting to find that all the studies except one mentioned above revealed that mass media contact was significantly related with attitude.

2.5.8 Cosmopoliteness and Attitude

Dixit (1988) found that cosmopoliteness of farmers was not found to be significantly associated with their attitude eventhough the number of visits were high but purpose was not to seek information on forestry and related aspects.

Swamy (1988) reported strong association between attitude of contact farmers and their cosmopoliteness.

Surekha (1997) reported that cosmopoliteness was significantly associated with their attitude.

From the above studies it could be inferred that cosmopoliteness had some influence on attitude of farmers.

2.5.9 Extension participation and attitude

Dixit (1988) reported that extension participation was not found to be associated with the attitude due to less number of activities conducted and poor quality of programme.

2.5.10 Scientific orientation and attitude

Hareesha (1994) reported that there was significant association between attitude and scientific orientation.

2.5.11 Management orientation and attitude

Swamy (1988) reported that there was no significant association between management orientation and attitude of contact farmers towards NAEP.

2.6 Contribution of personal, socio-psychological characteristics on perception and attitude of farmers towards homestead agroforestry

Dixit (1988) reported that independent variables like education, land holding, extension contact contribute significantly to explain the changes in attitude level.

Shailaja (1990) observed that 61.16 per cent of variation in productivity was explained by variables like farm size, attitude towards mixed farming, scientific orientation, education, farming experience, economic motivation and extension participation in descending order.

Nimbal (1995) in his study observed that education, family size, land holding livestock, annual income and mass media contributed significantly to explain changes in attitude.

Padmaiah (1995) reported that out of 16 variables studied, adoption of recommended practices in watershed area (R^2 = 0.156) risk orientation and economic motivation (R^2 = 0.230) in non-watershed area explained the variation in the perception of respondents.

Sangappa (1996) revealed that 48 per cent of variation in dependent variable was explained by four independent variables namely age, education, land holding and annual income.

2.7 Review of homestead models in the world

The farming systems are complex in West Africa. The different field systems are devoted to major staples and some cash crops. Dotted about these fields are stumps of fallow trees and protected, useful trees such as locust bean (*Parkia* sp.) in savanna, and the oil palm, breadfruit (*Treculia africana*), African pear (*Dacryodes edulis*), Oil bean (*Pentaclethra macrophylla*) in the rainforest areas. The various field systems are not only sources of food but are often also useful as sources of fibre, fuel wood, drugs, fodder and so on. Soil fertility in the compound or homestead garden is often maintained with animal manure, kitchen and compound refuse and crop residues. Two examples of the complexity of farms in the rainforest zone and in savanna area, respectively are shown in Figures 1 and 2.

Figure 3 indicate the structure of the farming systems commonly found in Swaziland. The small size of the cropping area, which averages about 3 hectares per homestead of about 10 persons in Swaziland, prevents farmers from growing their own trees and crops for fuel and fodder. Unmanaged natural bush lands and / or grass lands are set aside by law as community grazing lands for livestock which form a central and integral part of the farming system. These grazing lands provide fodder throughout the year for the animals as well as fuel for rural populations.

Fig. 4 depicts typical farming systems in san-fransico where the tuber crops such as cassava, taro, sweet potato are important crops along with banana and vegetables in the home gardens. These crops are grown along with mix of livestock such as cattle, goats, chickens and fish farming were also practiced.

The soil fertility maintenance was achieved by combination of inputs, particularly of household waste and high level of recycling of organic matter and nutrients.

Model of home garden of kerala

From the model (Fig. 5) it could be inferred that many species of trees, bushes vegetables and other herbaceous plants are grown in dense and apparently random arrangements, although some rational control over choice plants and their spatial and temporal arrangement were exercised. Home gardens also supported variety of animals (cow, buffalo, bullock, goat) and birds (chicken, chick). Fodder and legumes were widely grown to meet the

daily fodder requirements of cattle. Species diversity and varying production cycles of different components ensure continuous production throughout the year from the home garden system.

Salam (1992) based on a study conducted to develop a homestead model for coastal uplands of South Kerala reported that a model of 0.20 ha irrigated homestead would optimize the objective function of net returns while meeting the multiple requirements of a 4 member family was developed. It was essentially a coconut based mixed farming system in which crop and livestock components interacted synergistically to ensure optimum an farm resource utilization and enhanced productivity. It provided a return of Rs. 1.84 /rupee invested. Model was self consumptive, self sustaining and recycling agri ecosystem that was agronomically productive, economically efficient, technically viable and economically safe. (Fig. 6)

Farmers grow multipurpose trees and intercrops with vegetables and cereals near their homestead which meet their requirement of food, fruit, fuel, fodder and vegetables. Almost they intercrop the fruit orchards with maize, ginger, vegetables, pulses and oil seeds by supplying organic manure to the orchards. Fodder trees are also integral part of their agricultural systems which provide the feed to the livestock in the scarcity period. A simplified schematic model of traditional hill farming system is presented in Fig. 7.

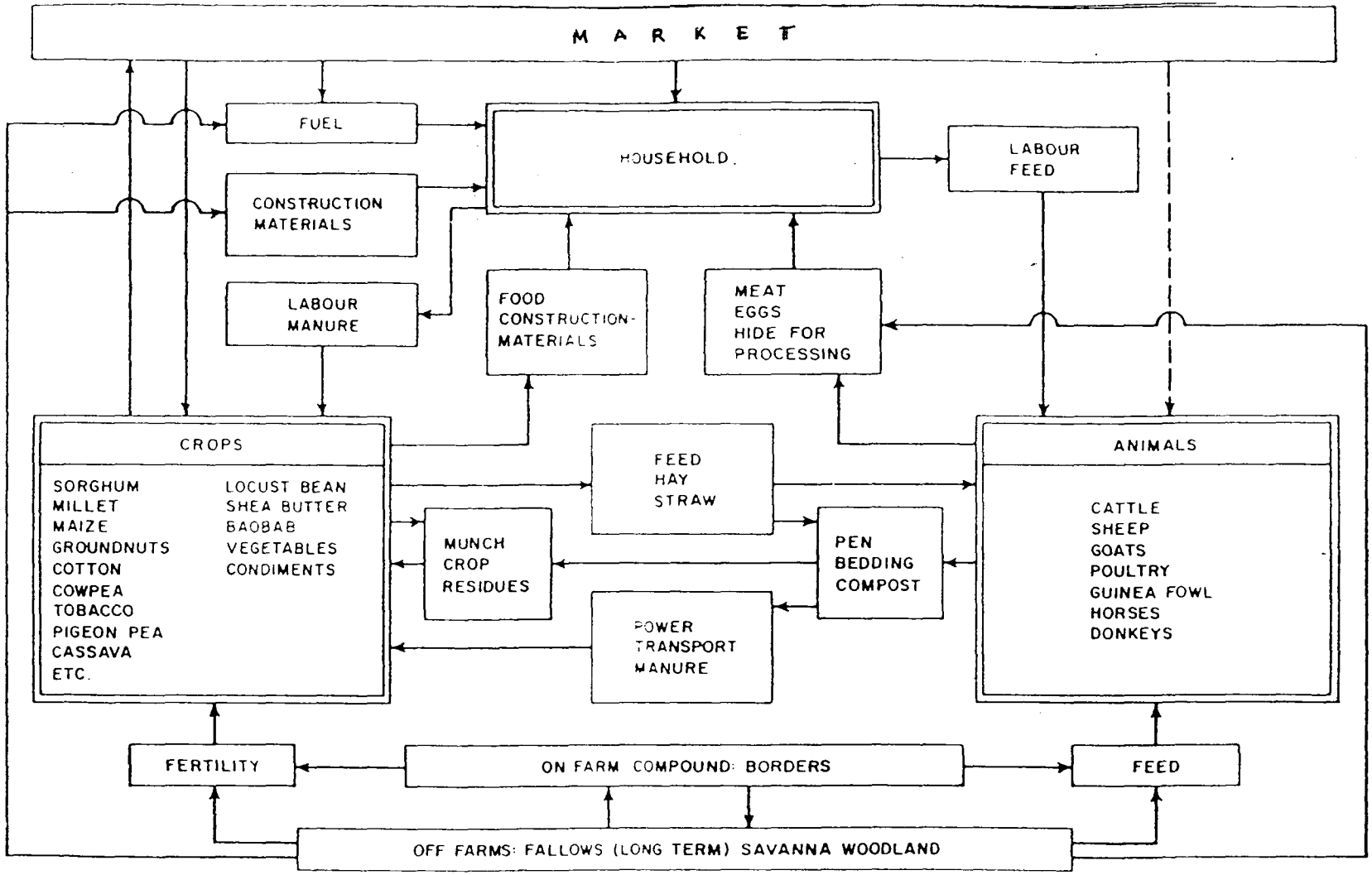


Fig. 1 : Compound farming with rudimentary sedimentary agriculture and bush fallowing in the Northern Guinea Savanna of Northern Nigeria [Adopted from McDowell and Hildebrand (1980)]

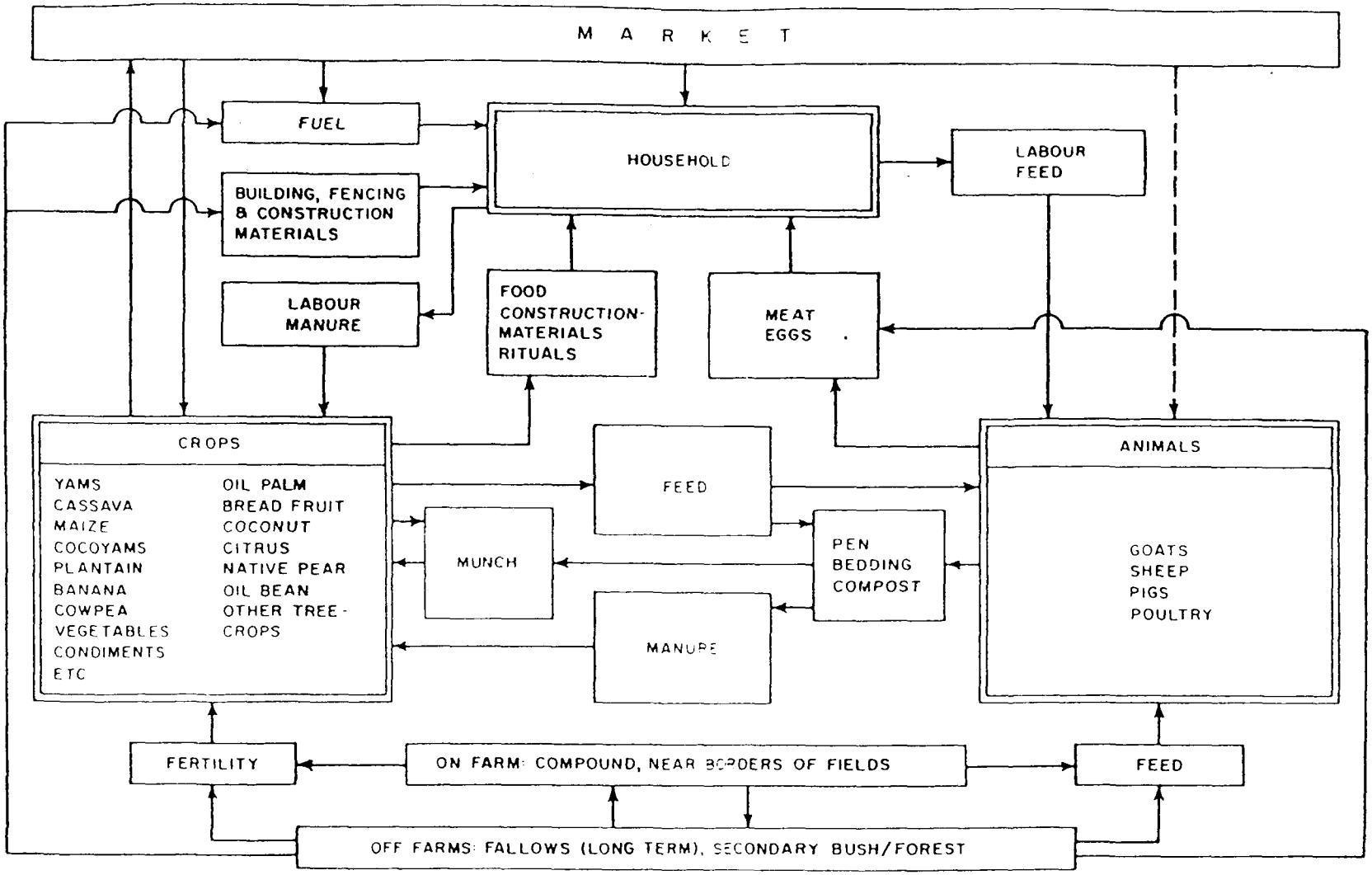


Fig. 2 : Compound farming, intensive cultivation and bush fallowing in a tropical rainforest region, Imo State, Nigeria [Adopted from McDowell and Hildebrand (1980)]

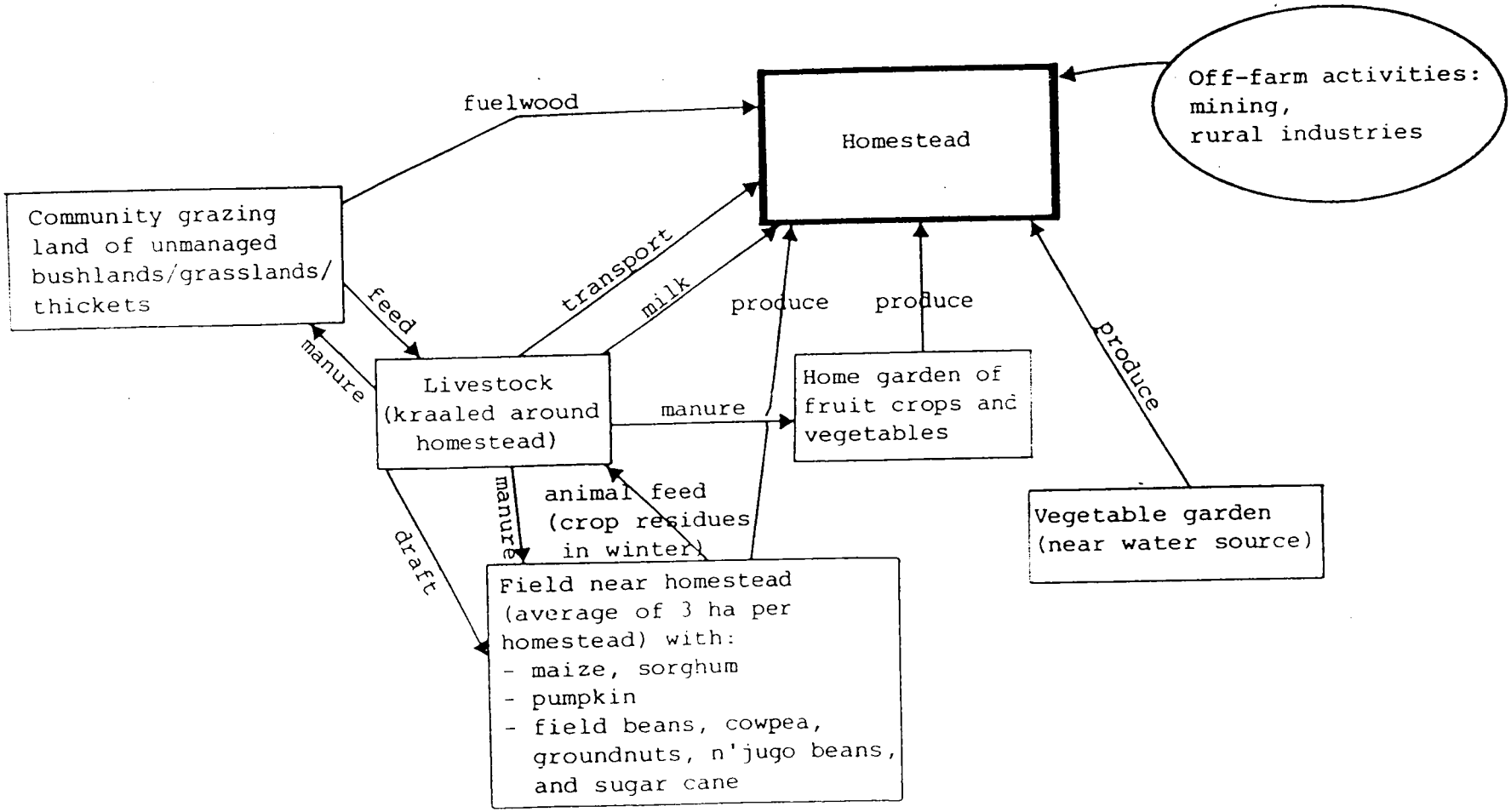


Fig. 3 : Schema showing some of the interrelationships in a typical animal – based cropping system in Swaziland (Godfrey, S, 1983)

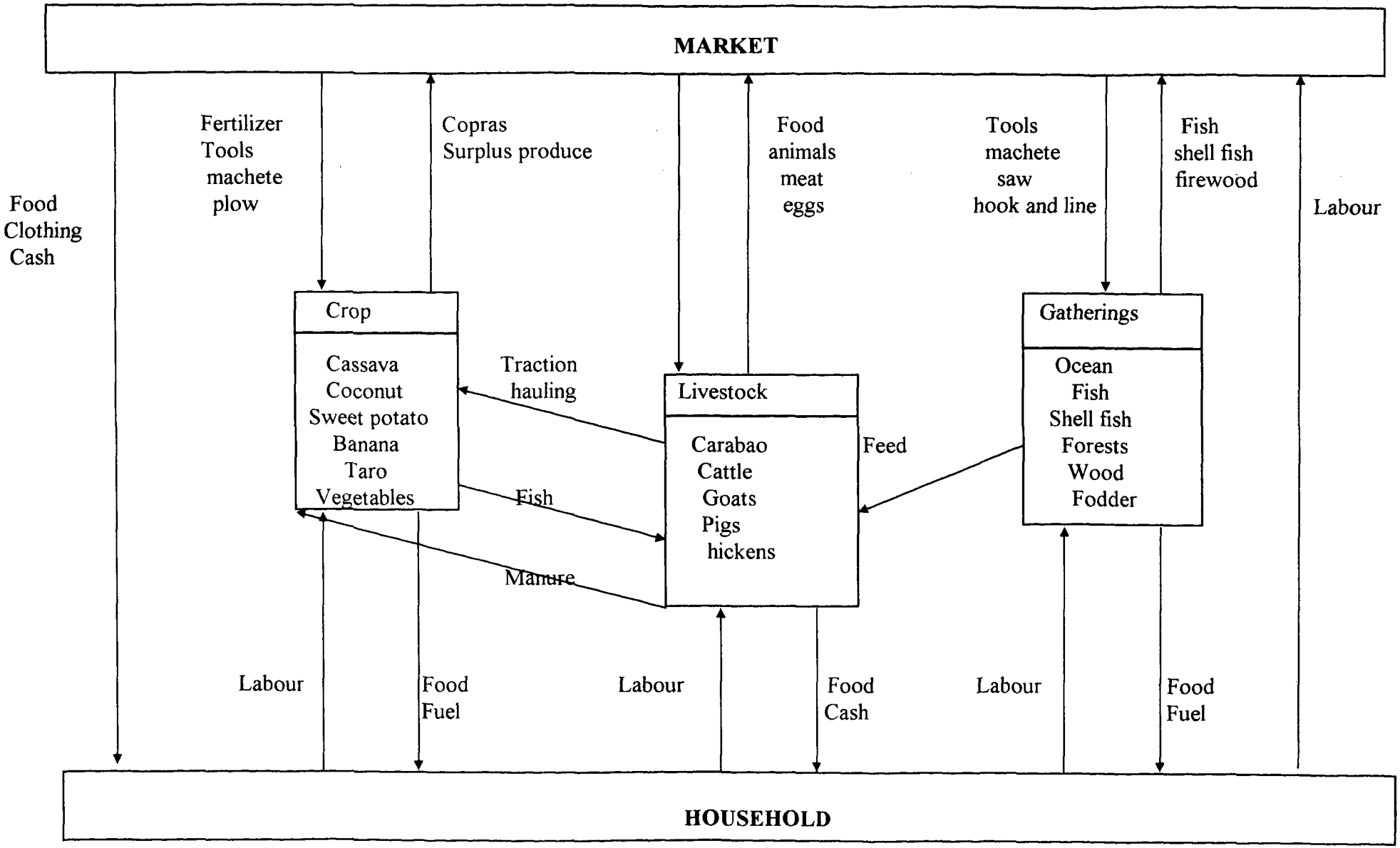


Fig 4 **Typical farming systems in San Francisco** (Source: Julie, P (1987))

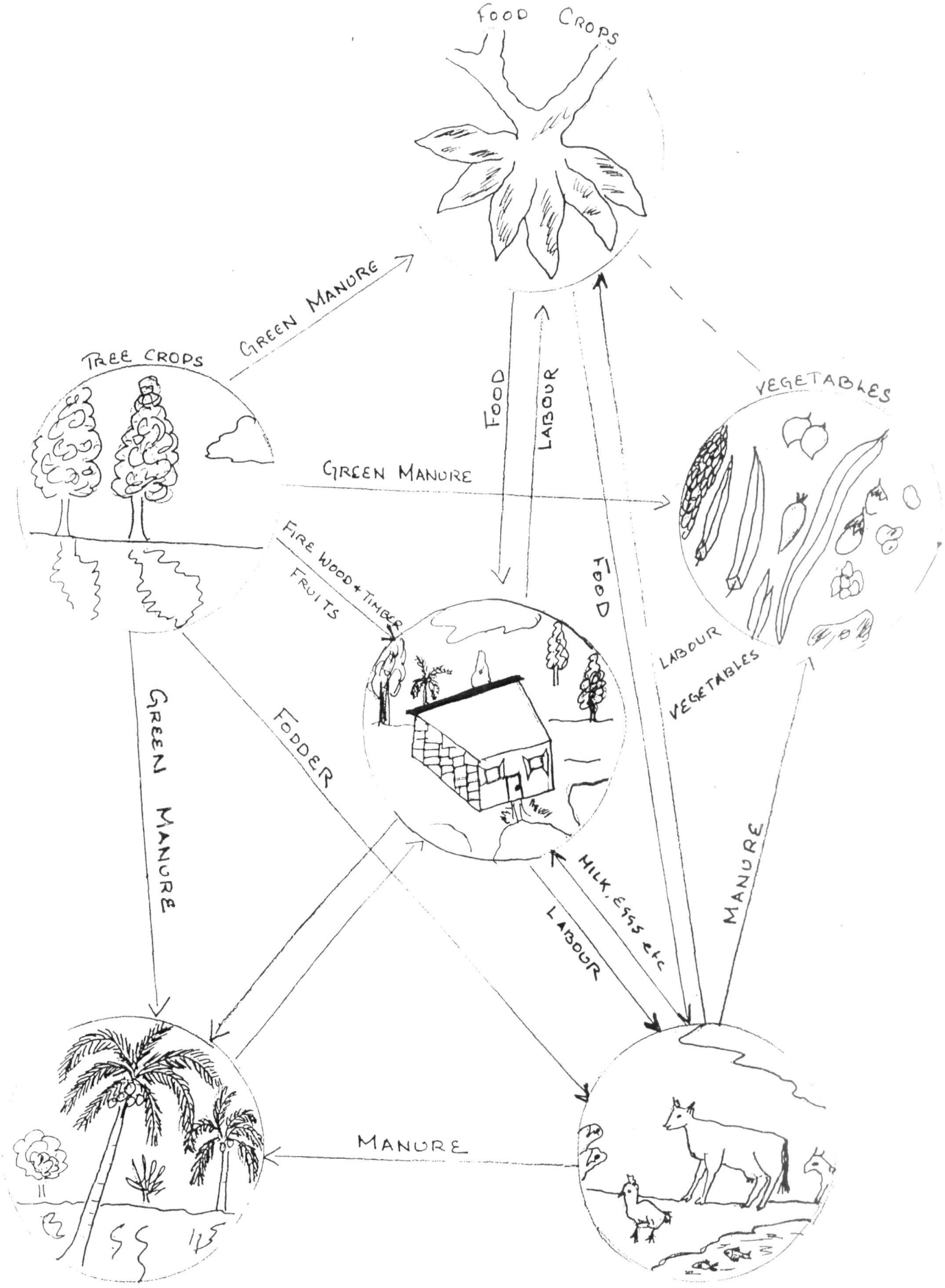
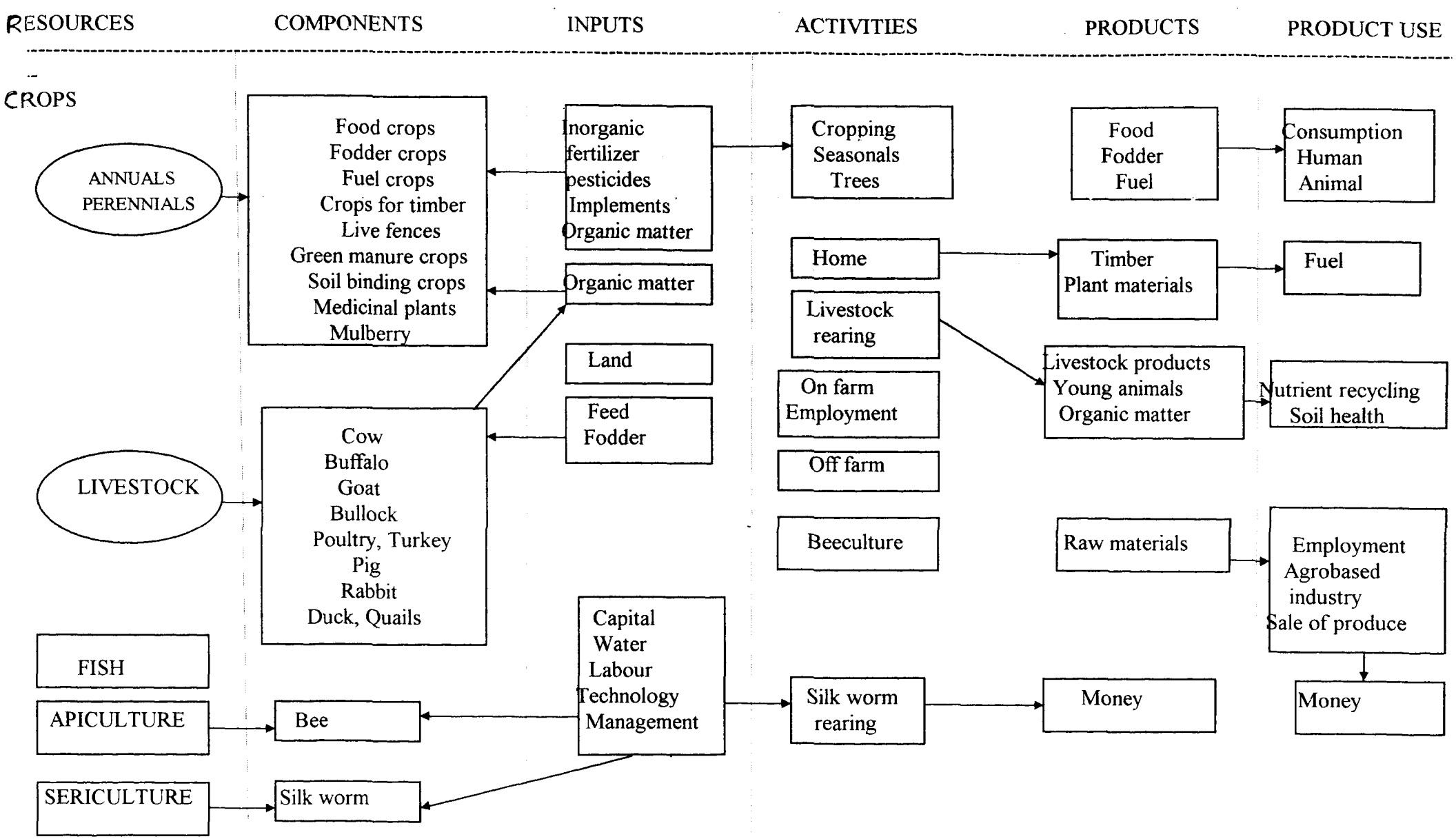


Fig. 5 : Schematic presentation of the interaction among major components of the homegardens of Kerala – India (Nair and Sreedharan, 1989)

FIG6: HOMESTEAD MODEL OF KERALA GIVEN BY SALAM et al (1992)



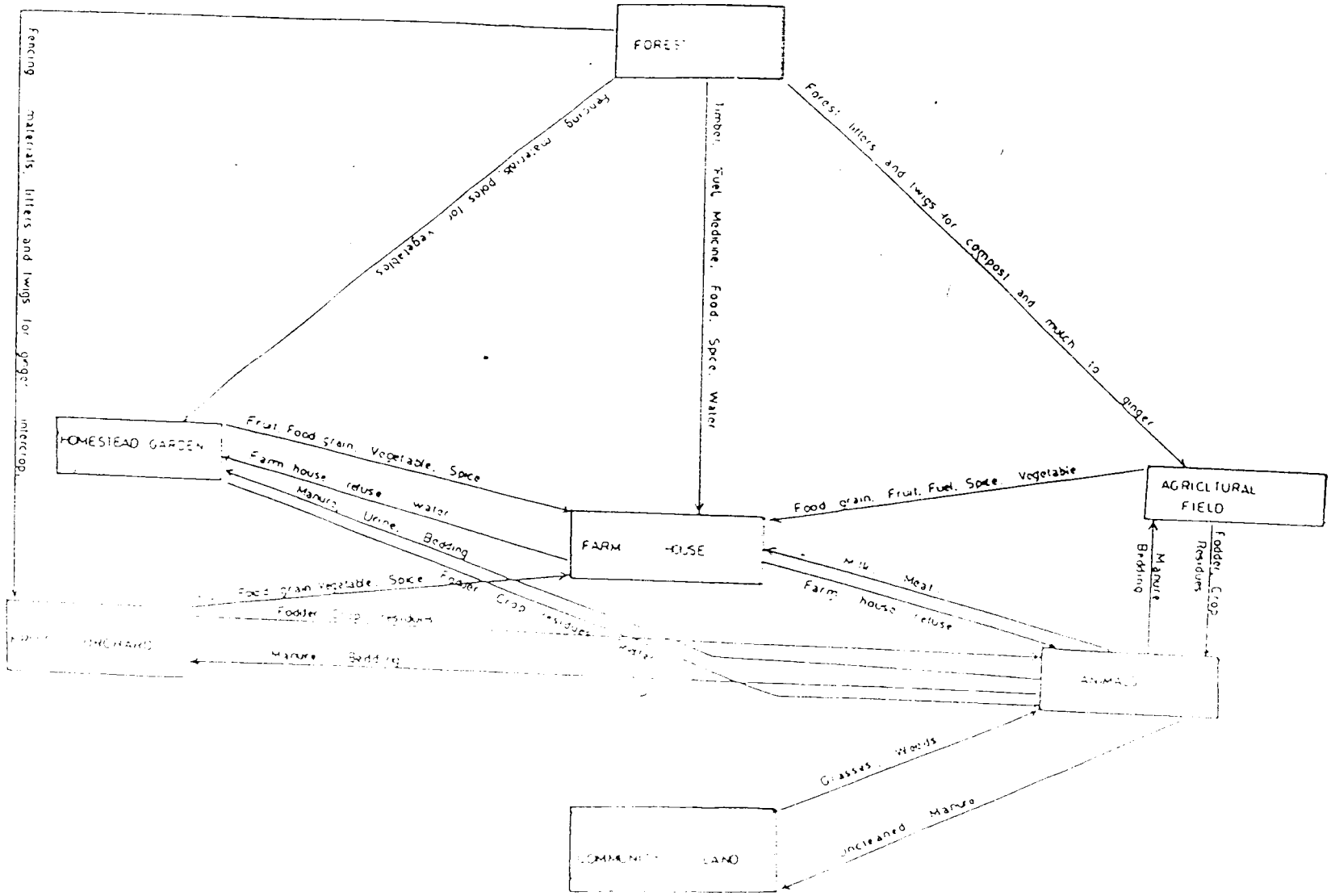


Fig. 7 : Principal interacting components in different agroforestry systems of Sikkim (Patiram, Bhadauria and Upadhyaya, 1996)

MATERIAL AND METHODS

III. MATERIAL AND METHODS

This study was undertaken with the principal objective of critically analysing farmers perception and attitude towards homestead agroforestry system prevailing in Kerala State. A general description of the methods and procedures followed in conducting this study is furnished in this chapter under following sub headings.

3.1 Research Design

The research design adopted for this study was of ex-post-facto in nature, since the phenomenon had already occurred.

According to Kerlinger (1973) ex-post- facto research is a systematic empirical inquiry in which the research does not have direct control over independent variables, because their manifestation has already occurred or because they are inherently not manipulated. Thus, inference about relations among variables was made without direct intervention from concomitant variation of independent and dependent variables. The main focus of the study was to measure the degree of perception and attitude of farmers towards homestead agroforestry system in Kerala and to identify its correlates.

3.2 Locale of the study

Kerala, the southern most state of the union of India with its 14 districts, was selected for the present study.

3.3 Selection of districts and taluks

The entire state of Kerala was divided into three distinct geographical zones, namely northern, central and southern zone for the purpose of sampling. From each zone one district was selected randomly to form the study area. The list of districts in each zone and the district selected for the study are given below

Zone-wise list of districts and districts selected for the study are

	Zones / districts	Districts selected for study
I.	**Northern zone**	
	Malapuram	Cannanore
	Calicut	
	Wynad	
	Cannanore	
	Kasargode	
II.	**Central zone**	
	Idikki	Trichur
	Ernakulam	
	Trichur	
	Palghat	
III.	**Southern zone**	
	Trivandrum	Quilon
	Quilon	
	Alleppey	
	Pathanamthitta	
	Kottayam	

From each of the selected districts one taluk was randomly selected, further from each taluk, three panchayats were selected using random sampling technique.

Name of the district	Taluk	Panchayat
Cannanore	Cannanore	Kaliasseri
		Pappinisseri
		Palikunnu
Trichur	Trichur	Porathissery
		Velookara
		Padiyur
Kollam	Kollam	Thrikkadavur
		Thrikarva and Perinad

Fig. 8 : Map of Kerala showing location of study

Plate 1 : Distant view of homestead

Plate 2 : View of homegarden showing crop – livestock interaction

3.4 Brief description of study area

Cannanore –

Total area of Cannanore district is 2966 sq. km. It is the northern most district of Kerala state hemmed in between the majestic western ghats and Lakshadweep sea. This beautiful tract of land has dense forests, extensive rawines with rich cash crops, low laterite lands with extensive paddy fields and coconut gardens. Important crops are coconut, arecanut, cashew, tapioca, pepper, rubber, ginger, fruit crops, lemon grass, nutmeg etc. CPCRI at Kasargode, Sugarcane Regional Sub Station at Kannur, Coconut Research Station at Pilicode and Nileshwar, Pepper Research Station at Panniyur are important institutions for giving guidelines to the development of agriculture and its methods.

Trichur –

Total area of Trichur district is 3032 sq. km. District slopes from the Western ghats in the east to the Lakshadweep sea in the west falling under three distinct natural divisions viz., the highland, mid land and lowland. Trichur is benefited by waters of 4 major rivers and has more than 75 per cent of total geographical area under different crops. The important crops are paddy, tapioca, coconut, arecanut, cashew, rubber, pulses, mango, jackfruit, banana, pineapple and spices like ginger, turmeric, nutmeg etc. are also grown.

The four major irrigation projects in Trichur districts are Peechi, Chalakkudy, Vazhani and Cheerakuzhy.

Kollam.

Total geographical area of the Kollam district is 2491 sq. kms. Geographically Kollam district comprises of three natural divisions viz., the low land bordering the sea coast, the mid land consisting of the undulating country of low hills, valleys east of the low lands and the highlands covering mainly forests. Paddy, sugarcane, pepper, arecanut, tapioca are some of important food crops and sesamum, coconut and rubber are the important commercial crops of the district. Other crops like cashew, banana, pulses and are also cultivated. Two major irrigation projects in the district are Kallada and Pampa projects. Major part of Homestead farming research is conducted in Farming systems research station , Sadanandapuram in Kollam district.

3.5 Population of the study

Total population of the study constituted the farmers of Kerala state practicing the homestead farming.

3.6 Selection of respondents

The basic unit of data collection for this study were the nine panchayats. A list of homestead farmers from each panchayat under study were obtained from the concerned Krishi Bhavan (the panchayat level agricultural extension unit headed by the Junior Agricultural officer in Kerala.)

From the list, 40 respondents from each district were selected using random sampling technique. Thus, the total of 120 farmers formed the strength of the respondents.

3.7 Variables and their empirical measurement :

The procedure followed to quantify and describe the variables selected for the study are given below.

3.7.1 Dependent variables

3.7.1.1 Perception :

Hodgetts (1979) discussed a person's view of reality and he observed that no two people will have the same perception in life and no two people see things exactly alike. On these lines an effort has been made to investigate the perception of farmers regarding homestead agroforestry in Kerala.

In this study perception is referred as the interpretation interms of usefulness by a farmer about HAF based on prior experience.

A scale developed by Latha (1996) was modified and followed in the present investigation to measure the perception of farmer towards HAF. In this,modified scale twelve statements under three sub headings were included with five response categories as highly suitable, moderately suitable, no change, less suitable and least suitable with scoring of 5, 4 , 3, 2 & 1 for positive statements and vice versa for negative statements. The summated

score thus obtained was considered as perception score of an individual respondents. The maximum score an individual could get on this scale was 60 and the minimum score was 12. The various components of perception along with the maximum score are shown below.

Sl. No.	Perception components	Number of items	Maximum score possible
1.	Ecological attribute	2	10
2.	Economic attributes	6	30
3.	Socio-psychological attributes	4	20

The total score range was worked out. These scores were further categorised high perception, medium perception and low perception categories based on standard deviation and mean.

Sl. No.	Category	Score
1.	High perception > $(\overline{X}+ ½ SD)$	44.54 and above
2.	Medium perception ($\overline{X} \pm ½ SD$)	40.74 to44.53
3.	Low perception < $(\overline{X} - ½ SD)$	40.73 and below

3.7.1.2 Attitude

Thurstone (1945) defined an attitude as the degree of positive or negative effect associated with some psychological object. In this study attitude refers to the predisposition of an individual towards HAF to form either favourable or unfavourableness towards it.

Scale developed by Anil Kumar (1988) was modified and followed in the present investigation to measure the attitude of the farmers towards HAF. In this modified scale, 16 statements were included with three response categories as agree, undecided and disagree with scoring 2, 1 and 0 respectively for positive statements and vice versa for negative statements. The summated score thus obtained was considered as attitude score of individual respondent. Total score range was worked out. These scores were further categorised as less favourable, favourable and more favourable attitude categories based on Standard deviation and mean. The maximum score an individual could get on this scale was 32 and the minimum score was 16.

Sl. No.	Category	Score
1.	Most favourable > ($\overline{X}$ + ½ SD)	22.6 and above
2.	Favourable ($\overline{X}$ + ½ SD)	20.2 to 22.5
3.	Less favourable (< $\overline{X}$ - ½ SD)	20.16 and below

3.7.2 Independent variables and their measurement

3.7.2.1 Age

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

The age of the respondents in completed years were considered for the purpose of analysis. The respondents were further classified into 3 groups as follows. Age of the farmers ranged between 33 to 72.

acres of dry land. Based on standard dry land area owned by family, the farm family were classified into three groups as marginal, small and big farmers. The area possessed by respondent ranged between 1.3 to 9 acres.

Sl. No.	Category of farmers	Land holding
1.	Marginal farmers	< 2.5 acres
2.	Small farmers	2.5 – 5 acres
3.	Big farmers	> 5 acres

3.7.2.4 Annual income

It refers to the total income earned by the respondent farmer both from agriculture and allied enterprises in one year as expressed by the respondents.

The respondents were classified based on annual income into three categories taking mean and Standard deviation as measured of check. The least income got by a respondent was 10,000 and maximum income was 1,34,000.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	5541 and above
2.	Medium ($\overline{X}$ + ½ SD)	25061 to 55420
3.	Low < ($\overline{X}$ - ½ SD)	25060 and below

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

3.7.2.2 Education

It refers to number of years of formal schooling completed by the respondents. Education of the respondents were quantified using the procedure followed. The maximum score one could get was 5 and minimum 0.

Sl No.	Level of education	Score	Category
1	Illiterate	0	Low education
2.	Primary school	1	
3.	Middle school	2	Medium education
4.	High school	3	
5.	College	4	High education
6.	Graduate and above	5	

3.7.2.3 Land holding

It refers to the area covered by an individual farmer measured in acres.

The actual land possessed by the farmers was recorded and this was converted into standard acres based on the Kerala land reforms act 38 of 1966. According to this act one acre of garden or wet land was considered equal to 3

3.7.2.5 Social participation

It refer to the degree of involvement of individuals in the formal social village organisations as a member or office bearer. Social organisations considered were :-

1) Grama panchayat.

2) Co-operative society

3) Planning and Padashekara committee

4) Others

For office bearers score of 2 and for members score of 1 was given.

Degree of participation	**Score**
Regular participated whenever conducted	2
Occasional participated in some meetings	1
Never – not participated in any meetings	0

The maximum score one could get was 16 and minimum score was 0. The respondents were differentiated into three categories taking mean and Standard deviation as a measure of check.

Sl. No.	**Category**	**Score**
1.	High participation > ($\overline{X}$ + ½ SD)	2.5 and above
2.	Medium participation ($\overline{X}$ + ½ SD)	0.76 - 2.5
3.	Low participation < ($\overline{X}$ - ½ SD)	0.75 and below

3.7.2.6 Extension contact

It refers to the extent of contacts of farmers with different extension agencies. Extension agents considered were-

1. Agricultural assistant
2. Agricultural officer
3. ADA
4. University Scientists
5. Others

The extent of extension contact by the respondents was computed by giving scores to the items as given below.

Categories	Scores
Never	0
Awareness	1
Occasional	2
Regular	3

The maximum score one could to get was 15 and minimum 0. The respondents were then classified into 3 categories using mean and Standard deviation as a measure of check.

Sl. No.	Category	Score
1.	High $> (\overline{X} + ½ SD)$	2.23 and above
2.	Medium $(\overline{X} + ½ SD)$	087-2.22
3.	Low $< (\overline{X} - ½ SD)$	0.86 and below

3.7.2.7 Mass media

It refers to the extent to which the respondents are exposed to different mass media of communication such as radio, newspaper, T.V., magazines etc. Further, the respondents were asked to indicate the frequency of utilization of different programmes in T.V., radio, then items in newspaper, magazines etc.

The extent of mass media contact by the respondents was computed by giving scores to the items as given below.

Items	Scores
Never	0
Occasional	1
Regular	2

The respondents were classified into 3 categories using mean and standard deviation as check. The maximum score one could get was 18 and minimum 0.

Sl. No.	Category	Score
1.	High $> (\overline{X} + \frac{1}{2} SD)$	9.07 and above
2.	Medium $(\overline{X} + \frac{1}{2} SD)$	5.47 – 9.06
3.	Low $< (\overline{X} - \frac{1}{2} SD)$	5.46 and below

3.7.2.8 Cosmopoliteness

Cosmopoliteness was assessed as suggested by Bhaskaran (1976) considering the extent of contacts outside the village community. The items and the scoring procedure were as under.

1) Frequency of visit to nearest town in one moth period.

Different items indicating the above mentioned behaviour were :-

Items	**Score**
Daily	5
Twice a week	4
Once a week	3
Twice a month	2
Once a month	1
Never	0

The scores assigned to above items were :

2) Considering the items of the purpose of visit the scores were given as below.

Purposes	**Scores**
Relating to agriculture	3
Forestry	2
Personal	1
Entertainment	0

The other aspect of delineating the cosmopoliteness was the membership in any organisation, outside the village. To quantify this variables, three alternative were provided :

Alternatives	Score
Non-member	0
Member	1
Office bearer	2

The respondents were classified into 3 categories using mean and SD as check. The maximum score one could get was 30 and minimum 0.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	6.95 and above
2.	Medium ($\overline{X}$ + ½ SD)	4.96 to 6.94
3.	Low < ($\overline{X}$ - ½ SD)	4.95 and below

3.7.2.9 Extension participation

It is the degree to which the respondent participated in extension educational activities like training, demonstrations, meetings, exhibitions, film shows etc. The scores of 3, 2, 1, 0 were assigned to regular, occasional, rare and no participation in extension activities respectively.

The respondents were classified into three categories using mean and SD as measure of check. The maximum score one could get was 18 and minimum 0.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	3.08 and above
2.	Medium ($\overline{X}$ + ½ SD)	1.76 – 3.07
3.	Low < ($\overline{X}$ - ½ SD)	1.75 and below

3.7.2.10 Scientific orientation

Scientific orientation is conceptualized as the degree to which a homestead farmer is oriented to the use of scientific methods in farming.

It was measured with the help of scale developed by Supe (1969). Instead of five point continum, three point continum- agree / undecided / disagree was used with scores of 0, 1,2 respectively in order to eliminate the difficulty in responding by farmers.

The respondents were classified into three categories based on mean and standard deviation. The maximum score one could get was 16 and minimum score was 0.

Sl. No.	Category	Score
1.	High > $(\overline{X} + ½ SD)$	11.44 and above
2.	Medium $(\overline{X} + ½ SD)$	9.77-11.43
3.	Low < $(\overline{X} - ½ SD)$	9.76 and below

3.7.2.11 Credit orientation

It is the degree to which an individual perceive that taking loan from the financing institutions is beneficial. Data were collected from respondents on their credit orientation and the score of 1 for 'yes' and 0 for 'no' responses respectively were given and 0, 1, 2, 3 scores were assigned for statements with 4 point continum.

The respondents were classified into three categories based on mean and standard deviation. The maximum score one could get was 8 and the minimum score was 0.

Sl. No.	Category	Score
1.	High $> (\overline{X} + ½ SD)$	4.65 and above
2.	Medium $(\overline{X} + ½ SD)$	3.56 – 4.64
3.	Low $< (\overline{X} - ½ SD)$	3.55 and below

3.7.2.12 Management orientation

It has been defined as the degree to which a homestead farmer is oriented towards scientific farm management comprising of planning, production and marketing functions of farm enterprises. Scale developed by Samanta (1977) was used.

Positive and negative statements were mixed retaining at the same time a more or less psychological order of statements. Score of 1 for 'Agree' and 0 for 'Disagree' were respectively given. The scores for each individual in the management orientation scale was obtained by summation of all scores.

The respondents were classified into three categories based on mean and standard deviation. The maximum score one could get on this scale was 15 and minimum was 0.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	4.93 and above
2.	Medium ($\overline{X}$ + ½ SD)	3.57- 4.92
3.	Low < ($\overline{X}$ - ½ SD)	3.56 and below

3.8 Methods used to quantify other selected items

3.8.1 Livestock possession

Livestock possession was assessed by adopting the procedures followed by Puttaswamy (1977) with slight modification. It was measured by the following the scoring procedure as detailed below.

	Scores
1. Possession of one bullock, possession of one local cow or local buffalow	4
2. Possession of improved cow or one improved buffalow	5
3. Possession of one sheep/ goat	3
4. Possession of hen	2
5. Possession of fish	1

The respondents were classified into three categories based on mean and Standard deviation

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	19.36532 and above
2.	Medium ($\overline{X}$ + ½ SD)	10.25469 – 16.36531
3.	Low < ($\overline{X}$ - ½ SD)	10.25468 and below

3.8.2 Crops

Number of crops grown were assessed by scoring each crops species. The respondents were classified into three categories based on mean and standard deviation.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	36.69 and above
2.	Medium ($\overline{X}$ + ½ SD)	28.27 – 36.68
3.	Low < ($\overline{X}$ - ½ SD)	28.26 and below

3.8.3 Profitability

Profitability was calculated by the subtraction of gross returns (generated from plantation, fruits, spices, vegetables, tubers, forest sp., medicinal plants and livestock) from the cost incurred. Profit = Gross returns – Total cost. The respondents were classified into three categories based on mean and standard deviation.

Sl. No.	Category	Score
1.	High > ($\overline{X}$ + ½ SD)	30679 and above
2.	Medium ($\overline{X}$ + ½ SD)	12479 – 30678
3.	Low < ($\overline{X}$ - ½ SD)	12478 and below

3.9 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 validity. 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.

3.10 Statistical methods used to analyse the data

The data thus collected for the purpose of the study were quantified, categorised and tabulated. Statistical methods used were :

1. Per centage – The data were presented in simple per centages to understand the nature of distribution of farmers.
2. Correlation test – simple correlation test
3. Chi-square tests were done
4. Stepwise regression analysis were employed.

3.11 Conceptual model of the study

This study was undertaken with the specific objectives of analysing perception and attitude of farmers towards homestead agroforestry.

In this study Homestead agroforestry is defined as kind of farming system practiced around the home, which consists of multitude of crops presenting a multitier canopy configuration along with livestock with the objective of getting maximum profit from both the enterprises through efficient utilization of resources. Further profitability was calculated from the gross returns(generated from the plantation, fruits. species, vegetables, tubers, forest

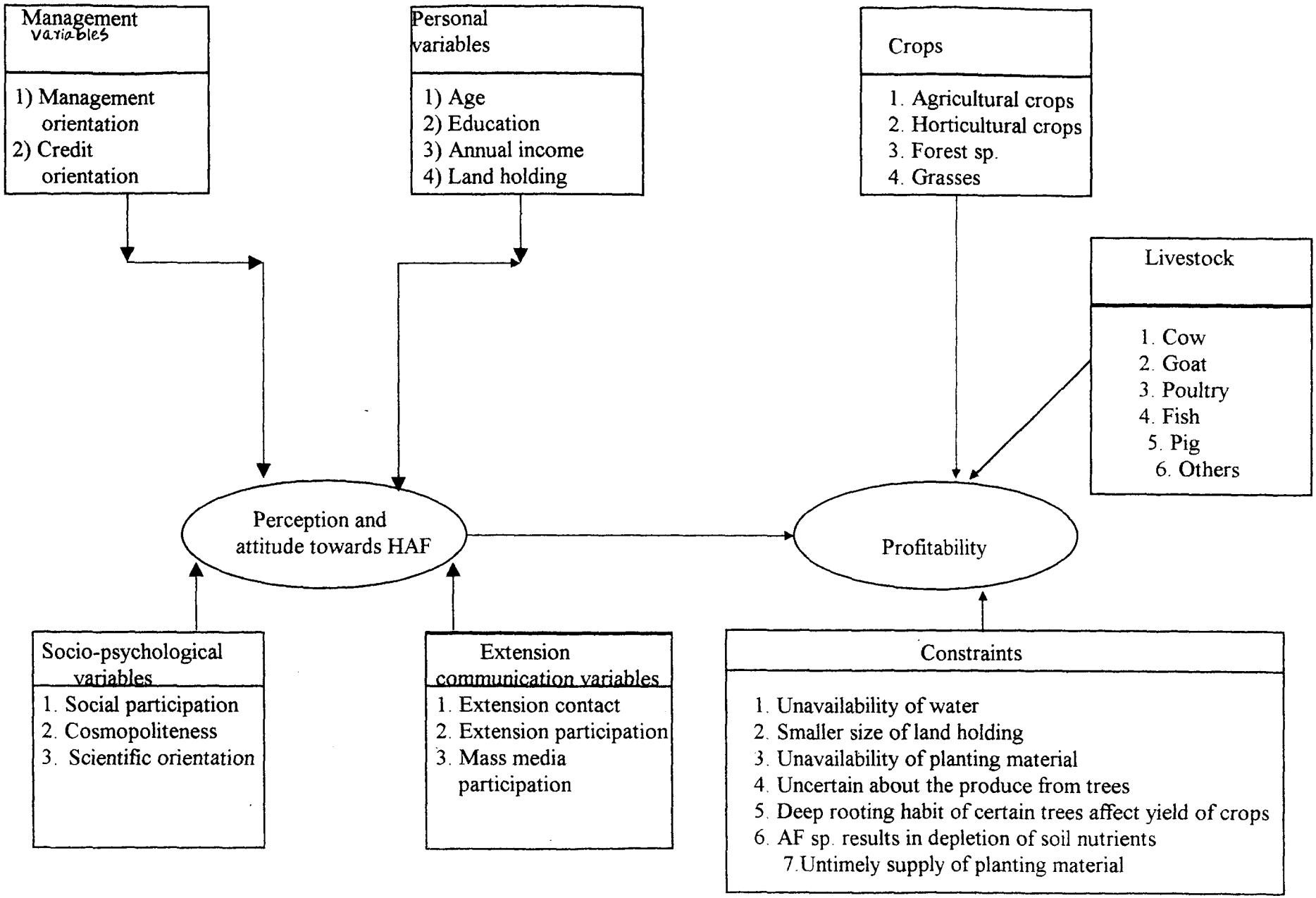


Fig. 9 **Conceptual model of study**

species, medicinal plants and livestock) minus the cost incurred. Profitability in homestead agroforestry is a multidimensional concept. It is purported to have relationship with perception and attitude. In addition to these management, personal, socio-psychological and extension communication variables are also related indirectly. Other items like crops and livestock exert direct relationship with profit whereas the constraints are indirectly related.

RESULTS

IV. RESULTS

In this chapter the results of the study are presented under the following headings.

4.1 Characteristic profile of homestead agroforestry farmers

4.2 Overall perception of farmers towards homestead agroforestry farmers

4.3 Classification of perception of homestead agroforestry farmers based on their personal and socio-psychological variables

4.4 Characters of farmers having low perception, medium perception and high perception towards homestead agroforestry

4.5 Attitutde of farmers towards homestead agroforestry

4.6 Classification of attitude of homestead agroforestry farmers based on personal and socio-psychological variables

4.7 Characters of farmers having less favourable, favourable and more favourable attitude towards homestead agroforestry

4.8 Relationship between personal and socio-psychological characteristics of homestead agroforestry and their perception

4.9 Relation between personal and socio-psychological characteristics of homestead farmers and their attitude

4.10 Contribution of personal and socio-psychological characteristics on perception and attitude of homestead farmers.

4.11 Crop diversity in the homestead farms.

4.12 Range of crop species in different sizes of land holding.

4.13 Classification of crop diversity based on land holding

4.14 Classification of profit level based on crop diversity

4.15 Classification of profit level based on land holding.

4.16 Classification of profit level based on livestock

4.1 Characteristic profile of homestead agroforestry farmers

For better understanding of the results it would be helpful to study the characteristics of the respondents from whom the data were collected.

4.1.1 Age

It could be seen from Table 1 that majority of the farmers i.e., 60.8 per cent belonged to old age group followed by 36.7 per cent under middle age. The number of farmers in young age group was very less i.e., only 2.5 per cent.

4.1.2 Education

A glance of Table 1 pointed out that 13 per cent of farmers had high level of education whereas 62 per cent had medium level of education and 25 per cent had low level of education.

Table 1 : Characteristic profile of homestead agroforestry farmers

n = 120

Sl. No	Characteristics	Categories	Criteria	N	%
1.	Age	Young	< 35 years	3	2.5
		Middle	36-50 years	44	36.66
		Old	> 50 years	73	60.83
2.	Education	Illiterate	0	0	0
		Primary school	1	16	13.33
		Middle school	2	34	28.33
		High school	3	40	33.33
		College	4	27	22.5
		Graduate and above	5	3	2.5
3.	Land holding	Marginal farmers	< 2.5	49	40.8
		Small farmers	2.5-5	57	47.5
		Big farmers	> 5	14	11.66
4.	Annual income	High	55421 and above	25	21
		Medium	25061 to 55420	52	43
		Low	25060 and below	43	35
5.	Social participation	High	2.48 and above	26	21
		Medium	0.74-2.47	41	34
		Low	0.73 and below	53	44
6.	Extension contact	High	2.23 and above	21	17
		Medium	0.86-2.22	65	54
		Low	0.85 and below	34	28
7.	Mass media contact	High	9.06 and above	45	37
		Medium	5.96 -9.05	31	25
		Low	5.95 and below	44	36
8.	Cosmopoliteness	High	6.94 and above	38	31
		Medium	4.95-6.93	51	42
		Low	4.94 and below	31	25
9.	Extension participation	High	3.07 and above	33	27
		Medium	1.75-3.06	36	30
		Low	1.74 and below	51	44

Sl. No	Characteristics	Categories	Criteria	N	%
10	Scientific orientation	High	11.43 and above	39	32
		Medium	9.76 -11.42	49	40
		Low	9.75 and below	32	26
11	Credit orientation	High	4.69 and above	42	35
		Medium	3.55-4.68	45	37
		Low	3.54 and below	33	27
12	Management orientation	High	4.92 and above	53	44
		Medium	3.56 - 4.91	32	26
		Low	3.55 and below	35	29

4.1.3 Land holding

Table 1 indicated that majority of the farmers i.e., 47.5 per cent are from the small category followed by 40.8 per cent of marginal farmers. Large farmers constituted the least i.e., 11.7 per cent.

4.1.4 Annual income

It could be seen from Table 1 that 21 per cent of the farmers had high annual income. Majority of the farmers i.e., 43 per cent possessed medium level of annual income while 35 per cent belonged to low income category.

4.1.5 Social participation

A perusal of Table 1 reveals that, majority of the farmers i.e., 44 per cent had low social participation followed by 34 per cent under medium social participation and 21 per cent had high social participation.

4.1.6 Extension contact

The cursory glance of Table 1 shows that most of the farmers i.e., 54 per cent had medium extension contact followed by 28 per cent under low category and 17 per cent under high category of extension contact.

4.1.7 Mass media contact

An observation of Table 1 makes quick clear that 37 per cent of farmers had high mass media contact and 36 per cent had low mass media contact whereas 25 per cent belonged to the medium category.

4.1.8 Cosmopoliteness

Table 1 reveals that majority of the farmers i.e., 42 per cent had medium level of cosmopoliteness while 31 per cent of farmers belonged to high cosmopoliteness group and the remaining 25per cent had low level of cosmopolitness.

4.1.9 Extension participation

An appraisal of Table 1 reveals that majority of the farmers i.e.,44 per cent had low extension participation followed by 30 per cent had medium extension participation and 27 per cent had high extension participation category.

4.1.10 Scientific orientation

Table 1 points out that majority of the farmers (40 per cent) had medium scientific orientation followed by 32 per cent and 26 per cent under high and low scientific orientation respectively.

4.1.11 Credit orientation

Table 1 cites that majority of the farmers (37 per cent) had medium credit orientation between, 35 per cent had high credit orientation and 27 per cent belonged to low credit orientation.

Table 2 : Overall perception of farmers towards homestead agroforestry

n = 120

Characteristic	Categories	Criteria	N	%	Mean	F value
Perception	High	45 and above	37	31	47.07	33.15*
	Medium	40:74 to 44.53	45	37	42.46	
	Low	40.73 and below	38	32	38.27	
	Overall		120	100	42.63	

* Significant at 0.01 Level

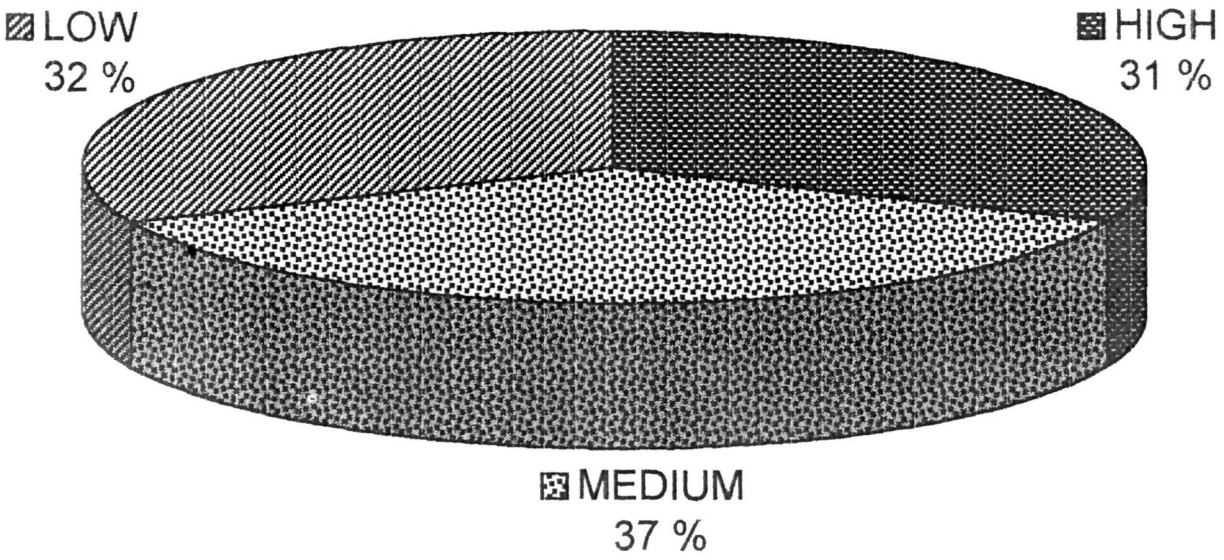


Fig 10: Overall perception of farmers towards homestead agroforestry

4.1.12 Management orientation

An observation of Table 1 makes quite clear that 44 per cent of farmer had high management orientation and 29 per cent had low management orientation whereas 26 per cent of farmers belonged to medium management orientation group.

4.2 Overall perception of farmers towards homestead agroforestry

Table 2 reveals that, majority (37 per cent) had medium perception followed by 32 per cent with low perception and 31 per cent had high perception. However, majority (68 %) of the farmers had medium to high perception. Further, it could be inferred that there is significant difference between perception of high, medium and low categories was observed.

4.3 Classification of perception of homestead agro forestry farmers based on their personal and socio-psychological variables

4.3.1 Perception and age of homestead agroforestry farmers

The data in Table 3a reveals that 100 per cent of 'young farmers' had high perception. In case of 'middle age group', majority of the farmers i.e., 41 per cent had high perception, followed by 34 per cent and 25 per cent of medium and low perception respectively, whereas in 'old age group', majority (40 per cent) had medium level perception followed by 36 per cent low and 25 per cent high perception levels. Chi square analysis indicated that there is significant association between perception and age.

TABLE 3: CLASSIFICATION OF PERCEPTION BASED ON THEIR PERSONAL AND SOCIO-PSYCHOLOGICAL VARIABLES

n = 120

Sl. no	Category	Low		Medium		High		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	
3a: Age										
	Young	0	0	0	0	3	100	3	100	
	Middle	11	5	15	34	18	41	44	100	10.35*
	Old	26	36	29	40	18	25	73	100	
	Total	37	31	45	38	39	32	120	100	
3b: Education										
	High	7	23	7	23	16	53	30	100	
	Medium	25	34	29	39	20	27	74	100	10.88*
	Low	5	31	9	56	2	12	16	100	
	Total	37	31	45	38	39	32	120	100	
3c : Land holdings (acres)										
	< 2.5	26	53	18	37	5	10	49	100	
	2.5-5	10	17	24	42	23	40	57	100	34.8**
	> 5	1	7	2	14	11	78	14	100	
	Total	37	31	45	38	39	32	120	100	
3d: Annual income										
	High	1	4	5	20	14	76	25	100	
	Medium	11	21	25	48	16	31	52	100	45.9**
	Low	25	58	15	35	3	7	43	100	
	Total	37	31	45	37	38	32	120	100	

* Significant at 0.05 level

** Significant at 0.01 level

4.3.2 Perception and education

Table 3b indicates that in 'high education category', 53 per cent had high perception and an equal per centage (23 per cent) had medium and low perception while in 'medium education category', majority (39 per cent) had medium perception followed by34 per cent and 27 per cent of low and high perception respectively. In case of 'low education category', 56 per cent had medium perception, 31 per cent low and 12 per cent had high perception. Chi square analysis showed that there is significant association between perception and education.

4.3.3 Per ception and land holding

Data from Table 3c indicate that majority of the farmers in the 'marginal category' have low perception i.e., 53 per cent followed by 37 per cent and 10 per cent had medium and high perception towards the homestead agroforestry respectively. In the category of 'small farmers', majority had medium perception (42 per cent) followed by 40 per cent and 17 per cent of high and low perception respectively. In case of 'big farmers' 78 per cent had high perception followed by 14 per cent and 7 per cent of medium and low perception respectively. Chi square analysis shows that there is significant association between perception and land holding.

4.3.4 Perception and annual income

Data from Table 3d indicates that majority (76 per cent) of farmers from the 'high income group' had high perception followed by 20 per cent of farmers with medium perception and 4 per cent with low perception. In next category i.e., 'middle income group' 31 per cent, 48 per cent and 21 per cent had high, medium and low perception respectively. In case of 'low income group' 37 per cent had medium perception followed by 32 per cent high and 31 per cent low perception. Chi square analysis shows that there is significant association between perception and annual income.

4.3.5 Perception and social participation

Table 3e indicates that majority (54 per cent) of farmers from the 'high social participation category] had high perception followed by 42 per cent of farmers with medium perception and 4 per cent with low perception.

Further, it is seen from the table that 46 per cent of farmers from 'medium category' had high perception and an equal per centage (27 per cent) had medium and low perception whereas in 'low social participation group' majority (37 per cent) of the farmers had medium perception while 32 per cent and 31 per cent had high and low perception respectively. Chi square analysis showed that there is significant association between perception and social participation.

Sl. no	Category	Low		Medium		High		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	

3e: Social participation

	High	1	4	11	42	14	54	26	100	28.35**
	Medium	11	27	11	27	19	46	41	100	
	Low	25	47	23	43	5	9	53	100	
	Total	37	31	45	37	38	32	120	100	

3f: Extension contact

	High	3	14	7	33	11	52	21	100	37.57**
	Medium	11	17	27	41	27	41	65	100	
	Low	23	68	11	32	0	0	34	100	
	Total	37	31	45	37	38	32	120	100	

3g: Mass media Contact

	High	12	27	11	24	22	49	45	100	21.7**
	Medium	4	13	16	52	11	35	31	100	
	Low	21	48	18	41	5	11	44	100	
	Total	37	31	45	37	38	32	120	100	

3h: Cosmopoliteness

	High	5	13	12	31	21	55	38	100	19.25**
	Medium	16	31	22	43	13	25	51	100	
	Low	16	52	10	32	5	16	31	100	
	Total	37	31	45	37	38	32	120	100	

** Significant at 0.01 level

4.3.6 Perception and extension contact

An examination of Table 3f projects that in the 'high extension contact group' 52 per cent had high perception while 33 per cent had medium and 14 per cent had low perception. In case of 'medium category' an equal per centage (41 per cent) had high and medium perception whereas 17 per cent had low perception. In 'low extension contact group', 68 per cent had low perception and rest 32 per cent had medium perception. Chi square analysis shows that there is significant association between perception and extension contact..

4.3.7 Perception and mass media contact

Data from Table 3g reveals that in 'high mass media contact category', nearly majority (49 per cent) of the farmers had high perception and 27 per cent had low followed by 24 per cent of medium perception. In 'medium category' 52 per cent had medium perception followed by 35 per cent and 13 per cent with high and low perception respectively. Whereas in the 'low mass media contact category' 98 per cent had low perception, 41 per cent had medium perception and 11 per cent had low perception. Chi square analysis indicated that there is significant association between perception and mass media contact.

Sl. no	Category	Low		Medium		High		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	

3i: Extention participation

	High	4	12	13	39	16	48	33	100	
	Medium	6	17	15	42	15	42	36	100	24.16**
	Low	27	53	17	33	7	14	51	100	
	Total	37	31	45	37	38	32	120	100	

3j:Scientific orientation

	High	3	8	14	36	22	56	39	100	
	Medium	16	33	22	45	11	22	49	100	37.75**
	Low	18	56	9	28	5	16	32	100	
	Total	37	31	45	37	38	32	120	100	

3k: Credit orientation

	High	2	5	16	38	24	57	42	100	
	Medium	16	35	20	44	9	20	45	100	26.80**
	Low	19	57	9	27	5	15	33	100	
	Total	37	31	45	37	38	32	120	100	

3j:Management orientation

	High	4	7	22	41	27	51	53	100	
	Medium	13	41	11	34	8	25	32	100	31.52**
	Low	20	57	12	34	3	8	35	100	
	Total	37	31	45	37	38	32	120	100	

** Significant at 0.01 level

4.3.8 Perception and cosmopoliteness

A perusal of Table 3h reveals that 51 per cent, 31 per cent and 13 per cent had high medium and low perception respectively in the 'high cosmopolite category'. In the next group of 'medium cosmopoliteness', 43 per cent had medium perception whereas 31 per cent had low perception and 25 per cent had high perception. It is seen from the 'low cosmopolite category', majority (52 per cent) had low perception, 32 per cent and 16 per cent had medium and high perception respectively. Chi square analysis shows that there is association between perception and cosmopoliteness.

4.3.9 Perception and extension participation

Table 3i reveals that in the 'high extension participation category', majority i.e., 48 per cent of the farmers had high perception, 39 per cent had medium perception and the rest of the 12 per cent had low perception. In case of 'medium category', an equal percentage of 42 per cent had high to medium perception and 17 per cent had low perception, but in 'low participation group' 37 per cent had medium perception, 32 per cent and 31 per cent had high and low perception respectively. Chi square analysis signifies that there is association between perception and extension participation..

4.3.10 Perception and scientific orientation

Table 3j reveals that 56 per cent of farmers had high perception, 36 per cent had medium and 8 per cent had low perception in the 'high scientific

orientation group'. In 'medium group', 45 per cent had medium perception followed by 33 per cent low perception and 22 per cent high perception but in 'low category', majority 56 per cent had low perception, 28 per cent and 16 per cent had medium to high perception respectively. Chi square analysis indicates that there is significant association between perception and scientific orientation.

4.3.11 Perception and credit orientation

A critical analysis of Table 3k reveals that among the 'high credit orientation category', majority (57 per cent) had high perception followed by 38 per cent medium perception and 5 per cent low perception. In case of 'medium category', majority 44 per cent had medium perception whereas 35 per cent and 20 per cent had low and high perceptions but in 'low credit orientation group' 57 per cent, 27 per cent and 15 per cent had high, medium and low perception respectively. Chi square analysis shows that there is significant association between perception and credit orientation.

4.3.12 Perception and management orientation

A cursory glance at Table 3l indicates that in 'high management orientation category'. Majority (51 per cent) of farmers had high perception whereas 41 per cent had medium and 7 per cent had low perception.

Table 4: **Characters of farmers having low perception towards homestead agroforestry**

n=120

Sl.No:	Characters	Mean scores
1	Age	54.86
2	Education	2.54
3	Land holding	2.24
4	Annual income	22,230
5	Social participation	0.64
6	Extension contact	0.70
7	Mass media contact	5.97
8	Cosmopoliteness	5.21
9	Extension participation	0.89
10	Scientific orientation	9.54
11	Credit orientation	3.37
12	Management orientation	3.27

Further in 'medium management orientation category', majority (41 per cent) had low perception whereas 34 per cent and 25 per cent had medium and high perception respectively. In case of 'low category', majority (57 per cent) had low perception followed by 34 per cent had medium perception and 8 per cent had high perception. Chi square analysis shows that there is significant association between perception and management orientation.

4.4 Characters of farmers having low, medium and high perception towards homestead agroforestry system in Kerala

4.4.1 Characters of farmers having low perception

Table 4 depicts that farmers having low perception towards homestead agroforestry were mostly old aged (i.e., 50years and above) and were educated upto middle school. Marginal land holding (less than 2.5 acres) corresponding with low income (25,069 and below) was the characteristic feature of these farmers. Farmers having low perception towards homestead agroforestry farmers involved to a very less extent in various social organisations' activities (0.73 and below) like grama panchayat, co-operative society etc. They also had very low contact (0.86 and below) with various extension agents. Access to T.V, radio, newspaper and other mass media sources and their cosmopolite nature was observed upto medium extent. Participation by these farmers in various extension activities was low (1.75 and below). Scientific orientation, credit orientation and management orientation of these farmers were found to be low.

Table 5: **Characters of farmers having medium perception towards homestead agroforestry** n=120

Sl.No:	Characters	Mean scores
1	Age	55.44
2	Education	2.46
3	Land holding	2.97
4	Annual income	34,033
5	Social participation	1.46
6	Extension contact	1.53
7	Mass media contact	6.71
8	Cosmopoliteness	5.75
9	Extension participation	2.20
10	Scientific orientation	10.57
11	Credit orientation	4.20
12	Management orientation	4.42

Table 6: **Characters of farmers having high perception towards homestead agroforestry** n=120

Sl.No:	Characters	Mean scores
1	Age	50.36
2	Education	3.21
3	Land holding	4.61
4	Annual income	65,126
5	Social participation	2.71
6	Extension contact	2.36
7	Mass media contact	9.18
8	Cosmopoliteness	6.98
9	Extension participation	3.23
10	Scientific orientation	11.65
11	Credit orientation	4.68
12	Management orientation	4.97

4.4.2 Characters of farmers having medium perception

A perusal of Table 5 reveals that farmers having medium perception towards HAF were mostly from old age group (51 years and above). It was observed that majority of them were educated upto middle school. Mostly they were small farmers (2.5 – 5 years) with medium annual income. Medium involvement and participation in the activities of social organisations (0.8 – 2.4) was observed in this category of farmers, medium level of contact with various extension agents like AA, AO etc. was also observed. Access to various mass media sources and the cosmopolite nature of the farmers, having medium perception towards HAF was observed upto medium level. Participation by these farmers in various extension activities was upto medium extent (1.76 – 3.07). Medium level of scientific orientation, credit orientation and management orientation were the characteristics features of the farmers having medium perception towards HAF.

4.4.3 Characters of farmers having high perception

Glance at Table 6 reveals that farmers having high perception towards HAF were mostly from middle to old age group. It was observed that majority of them were educated upto high school some of them were also graduates. Majority of these group constituted of small farmers (2.5 – 5 acres), some were also big farmers (5 acres and above). They had a high annual income (55,421 and above) as compared with the other two groups. High

Table 7 : Overall attitude of farmers towards homestead agroforestry

n = 120

Characteristic	Categories	Criteria	N	%	Mean	F value
Attitude	More favourable	22.4716 and above	37	31	24.18	31.56*
	Favourable	20.117 to 22.4715	33	27	21.92	
	Less favourable	20.116 and below	50	42	19.06	
	Overall		120	100	21.29	

* Significant at 0.01 Level

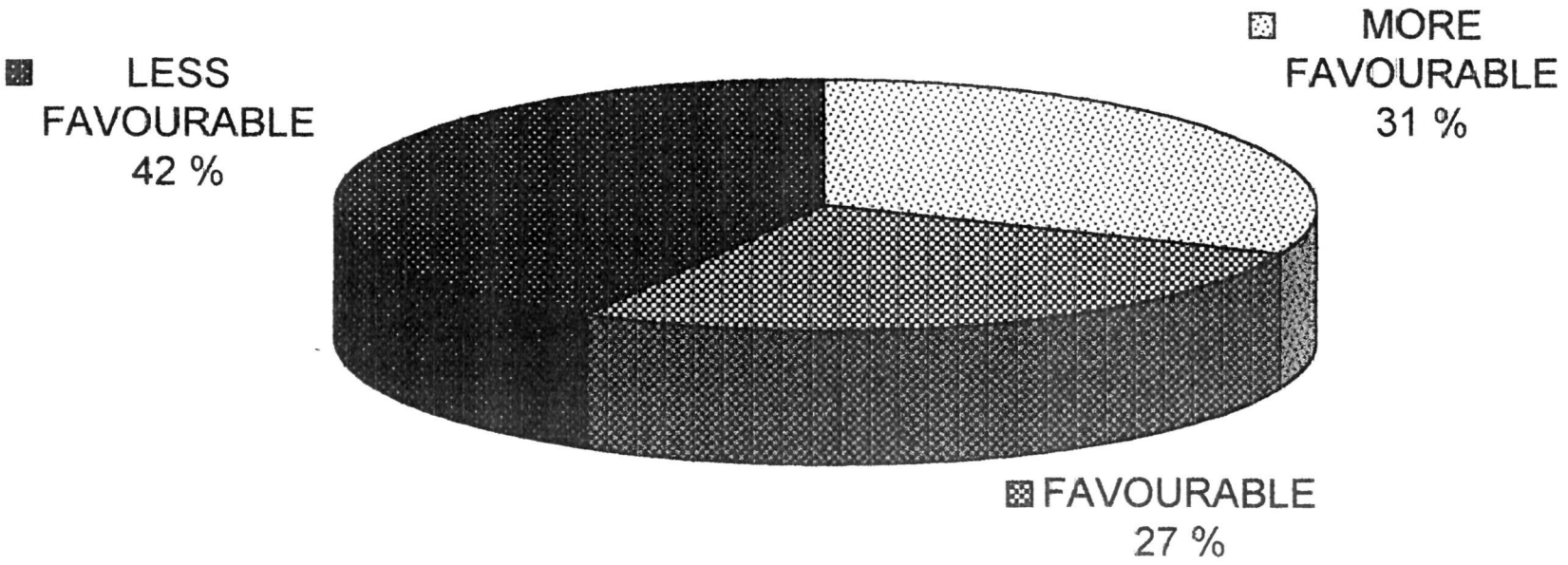


Fig 11: Overall attitude of farmers towards homestead agroforestry

participation and involvement in various social organisation (2.5 and above) was observed among the farmers having high perception towards HAF. Farmers had high contact with extension agents (2.23 and above) with very good access to various mass media sources (9.07 and above) and were highly cosmopoliteness in nature (6.95 and above). Their participation level in various extension activities were higher (3.09 and above). High level of scientific orientation, credit orientation and management orientation were the characteristic features of the farmers having high perception towards HAF.

4.5 Overall attitude of farmers towards homestead agroforestry.

Table 7 indicates that majority (42%) of farmers had less favourable attitude towards homestead agroforestry. Twenty seven per cent of farmers exhibited more favourable attitude and 27 per cent had favourable attitude towards homestead agroforestry. In overall, majority of the farmers was having favourable to more favourable attitude. Significance of F value indicates that there is significant difference in attitude level among the farmers of 'more favourable', 'favourable' and 'less favourable categories'.

4.6 Classification of attitude level of homestead agroforestry farmers based on their personal and socio-psychological variables

4.6.1 Attitude and age

Data in Table 8a reveals that 50 per cent of 'young farmers' had less favourable attitude and equal per centage (25 per cent) had favourable and

TABLE 8: CLASSIFICATTON OF ATTITUDE BASED ON THEIR PERSONAL AND SOCIO-PSYCHOLOGICAL VARIABLES

n = 120

Sl. no	Category	Less favourable		Favourable		More favourable		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	
8a: Age										
	Young	2	50	1	25	1	25	4	100	14.04**
	Middle	16	37	8	19	19	44	43	100	
	Old	32	44	24	33	17	23	73	100	
	Total	50	42	33	27	37	31	120	100	
8b: Education										
	High	10	33	5	17	15	50	30	100	23.68**
	Medium	28	38	26	35	20	27	74	100	
	Low	12	75	2	12	2	12	16	100	
	Total	50	42	33	27	37	31	120	100	
8c : Land holdings (acres)										
	< 2.5	31	63	12	24	6	12	49	100	44.71**
	2.5-5	18	31	20	35	19	33	57	100	
	> 5	1	7	1	21	12	86	14	100	
	Total	50	42	33	27	37	31	120	100	
8d: Annual income										
	High	1	4	6	24	18	72	25	100	56.42**
	Medium	18	35	18	35	16	31	52	100	
	Low	31	72	19	21	3	7	43	100	
	Total	50	42	33	27	37	31	120	100	

* Significant at 0.05 level

** Significant at 0.01 level

more favourable attitude. In case of 'middle age group', majority 44 per cent had more favourble attitude whereas 37 per cent had less favourable and 19 per cent had favourable attitude but in 'old age group', majority 44 per cent had less favourable while 33 per cent had favourable and 23 per cent had more favourble attitude. Chi square analysis indicates that there is significant association between attitude and age.

4.6.2 Attitude and education

Table 8b indicates that in 'high education category' 50 per cent had more favourable attitude, 33 per cent had less favourable and 17 per cent had favourable attitude while in 'medium education category', majority (38 per cent) had less favourable attitude followed by 35 per cent had favourable and 27 per cent had less favourable attitude. In case of 'low education category', majority (75 per cent) had less favourable attitude whereas an equal per centage (12 per cent) had favourable to more favourable attitude. Chi square analysis shows that there is association between attitude and education.

4.6.3 Attitude and land holdings

Data from Table 8c indicates that in the 'marginal category', majority had less favourable i.e., 63 per cent attitude followed by 24 per cent had favourable attitude and 12 per cent had more favourable attitude while in 'small farmers category' 35 per cent had favourable attitude and 33 per cent

had more favourable attitude followed by less favourable attitude of 31 per cent. In case of 'big farmers', majority of them i.e., 86 per cent had more favourable attitude and an equal percentage (7 per cent) had favourable to less favourable attitude. Chi square analysis indicates that there is significant association between attitude and their land holding level.

4.6.4 Attitude and annual income

Data from Table 8d reveals that majority (72 per cent) of farmers from the 'high income group' had more favourable attitude followed by 24 per cent with favourable attitude and 4 per cent had less favourable attitude.

In next category i.e., 'middle income group' an equal percentage (35 per cent) had favourable to less favourable attitude and the rest 31 per cent had more favourable attitude. In case of 'low income group' 72 per cent had less favourable attitude, 21 per cent and 7 per cent had favourable and more favourable attitude respectively. Chi square analysis shows that there is significant association between attitude and annual income.

4.6.5 Attitude and social participation

Table 8e indicated that majority (50 per cent) of farmers from the 'high social participation category' had more favourable attitude followed by 30 per cent of farmers with favourable attitude and 9 per cent with less favourable attitude.

Sl. no	Category	Less favourable		Favourable		More favourable		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	

8e: Social participation

	High	5	9	8	30	13	50	26	100	30.41**
	Medium	14	34	12	29	13	31	41	100	
	Low	31	58	13	24	11	21	53	100	
	Total	50	42	33	27	37	31	120	100	

8f: Extension contact

	High	6	28	4	19	11	52	21	100	47.10**
	Medium	17	26	22	34	26	40	65	100	
	Low	27	28	7	20	0	0	34	100	
	Total	50	42	33	27	37	31	120	100	

8g: Mass media exposure

	High	11	24	8	18	26	58	45	100	37.77**
	Medium	13	42	10	32	8	26	31	100	
	Low	26	59	15	34	3	7	44	100	
	Total	50	42	33	27	37	31	120	100	

8h: Cosmopoliteness

	High	6	16	12	31	20	53	38	100	39.09**
	Medium	21	41	16	31	14	27	51	100	
	Low	23	74	5	16	3	10	31	100	
	Total	50	42	33	27	37	31	120	100	

** Significant at 0.01 level

Further, it could be observed from the table that 34 per cent had less favourable attitude followed by 31 per cent more favourable and 29 per cent had favourable attitude in the 'medium category' whereas in 'low social participation category', majority (58 per cent) of farmers had less favourable attitude while 24 per cent had favourable and 21 per cent had more favourable attitude towards homestead agroforestry. Chi square analysis shows that there is significant association between attitude and social participation.

4.6.6 Attitude and extension contact

An examination of Table 8f projects that in the 'high extension contact category' 52 per cent had more favourable attitude while 28 per cent had less favourable attitude and 19 per cent had favourable attitude towards homestead farming. In case of 'medium contact category' 40 per cent of farmers had more favourable attitude followed by 34 per cent of favourable and 26 per cent of less favourable attitude. In 'low extension contact category', majority 79 per cent had less favourable attitude and the rest of 21 per cent had favourable attitude. Chi square analysis shows that there is significant association between attitude and extension contact.

4.6.7 Attitude and mass media contact

Data from Table 8g reveals that in 'high mass media contact category', majority 58 per cent had more favourable attitude and 24 per cent had less

favourable attitude, followed by 18 per cent of favourable attitude. In 'medium category', majority (42 per cent) had more favourable attitude followed by 32 per cent of favourable and 26 per cent had less favourable attitude, whereas in 'low mass media contact category' 59 per cent had less favourable attitude, 34 per cent had favourable and rest of the 7 per cent had more favourable attitude. Chi square analysis shows that there is significant association between attitude and mass media contact.

4.6.8 Attitude and cosmopoliteness

A perusal of Table 8h reveals that 53, 31 and 16 per cent had more favourable, favourable and less favourable attitude respectively in the 'high cosmopolite category'. In the next group of 'medium cosmopoliteness', majority 41 per cent had less favourable attitude followed by 31 per cent of favourable and 27 per cent had more favourable attitude. It was observed that from the 'low cosmopolite category', majority 74 per cent had less favourable attitude. 16 per cent and 10 per cent had favourable and more favourable attitude respectively. Chi square analysis shows that there is significant association between attitude and cosmopoliteness.

4.6.9 Attitude and extension participation

Table 8i reveals that in the 'high extension participation category', majority i.e., 48 per cent of farmers had more favourable attitude, 33 per cent

Sl. no	Category	Less favourable		Favourable		More favourable		Total		CHI-SQUARE
		n	%	n	%	n	%	n	%	
8i: Extention participation										
	High	6	18	11	33	16	48	33	100	40.23**
	Medium	9	25	14	39	13	36	36	100	
	Low	35	69	8	16	8	15	51	100	
	Total	50	42	33	27	37	31	120	100	
8j:Scientific orintation										
	High	8	20	14	36	17	43	39	100	27.89**
	Medium	20	41	14	28	15	30	49	100	
	Low	22	69	5	15	5	16	32	100	
	Total	50	42	33	27	37	31	120	100	
8k: Credit orintation										
	High	9	21	14	33	19	45	42	100	55.81**
	Medium	12	27	16	35	17	38	45	100	
	Low	29	88	3	9	1	3	33	100	
	Total	50	42	33	27	37	31	120	100	
8l:Management orientation										
	High	11	21	16	30	26	49	53	100	38.29**
	Medium	13	41	9	28	10	31	32	100	
	Low	25	71	8	23	1	6	35	100	
	Total	50	42	33	27	37	31	120	100	

** Significant at 0.01 level

had favourable attitude and the rest of the 18 per cent had less favourable attitude. In case of 'medium category' 39 per cent had favourable attitude while 36 per cent had more favourable attitude and 25 per cent had less favourable attitude, but in 'low participation category' 69 per cent had less favourable attitude followed by 16 per cent and 15 per cent had favourable and more favourable attitude respectively. Chi square analysis shows there is significant association between attitude and extension participation.

4.6.10 Attitude and scientific orientation

Table 8j reveals that 43 per cent of farmers had more favourable attitude, 36 per cent favourable and 20 per cent had less favourable attitude in the 'high scientific orientation category'. In 'medium category' 41 per cent had less favourable attitude followed by 30 per cent of more favourable attitude and 28 per cent of favourable attitude but in 'low category', majority (69 per cent) had less favourable attitude whereas 16 per cent had more favourable and 15 per cent had favourable attitude. Chi square anlysis shows that there is significant association between attitude and scientific orientation.

4.6.11 Attitude and credit orientation

A critical analysis of Table 8k reveals that among the 'high credit orientation category', majority (45 per cent) had more favourable attitude followed by 33 per cent favourable attitude and 21 per cent had less

favourable attitude. In case of 'medium category', majority (38 per cent) had more favourable attitude whereas 35 per cent had favourable attitude followed by 27 per cent of less favourable attitude but in 'low credit orientation category', majority, i.e.88 per cent had less favourable attitude where as only 9 per cent and 3 per cent had favourable attitude and more favourable attitude respectively. Chi square analysis shows that there is significant association between attitude and credit orientation.

4.6.12 Attitude and management orientation

A cursory glance at Table 81 indicates that in 'high management orientation category', majority (49 per cent) of farmers had more favourable attitude whereas 30 per cent had favourable and 21 per cent had less favourable attitude.

Further, in 'medium management orientation category', majority (41 per cent) had less favourable attitude followed 31 per cent and 28 per cent had more favourable and favourable attitude, respectively. In case of 'low category', majority (71 per cent) had less favourable attitude whereas 8 per cent had favourable attitude and only 1 per cent had more favourable attitude.

Chi square analysis shows that there is significant association between attitude and management orientation.

Table 9: **Characters of farmers having less favourable attitude towards homestead agroforestry**

N=120

Sl.No:	Characters	Mean scores
1	Age	55.02
2	Education	2.50
3	Land holding	2.41
4	Annual income	24,881
5	Social participation	0.72
6	Extension contact	0.72
7	Mass media contact	5.58
8	Cosmopoliteness	4.96
9	Extension participation	1.16
10	Scientific orientation	9.82
11	Credit orientation	3.57
12	Management orientation	3.48

4.7 Characters of farmers having less favourable, favourable and more favourable attitude towards homestead agroforestry

Table 9 depicts that farmers having less favourable attitude were mostly old aged (51 years and above) and were educated more than middle school level. Marginal land holding (2.5 acres and below) corresponding with low annual income was a characteristic features of these farmers. Farmers having low attitude towards HAF involved to a very less extent in various social organisation (0.73 and below) like grama panchayat, cooperative society etc. They also had very low extension contact (0.86 and below) with various extension agents. Access to various mass media sources and their cosmopolite nature was observed upto medium extent. Participation of these farmers in various extension activities was low (1.75 and below). Scientific orientation, credit orientation and management orientation of these farmers were found to be low.

A perusal of Table 10 reveals that farmers having favourable attitude towards HAF were mostly from old age groups (51 years and above). It was observed that majority of them were educated upto middle schools while some had studied upto high school. Mostly this group comprised of small farmers with land holding of 2.5 – 5 acres. Their annual income ranged from 25,060 – 55,420. Medium involvement and participation (0.8 – 2.4) was observed in this category of farmers. Medium level of contact (0.87 – 2.22) with various extension agents like AA, AO etc. was observed. Access to various mass media sources and the cosmopolite nature of farmers having favourable

Table 10: **Characters of farmers having favourable attitude towards homestead agroforestry**

n=120

Sl.No:	Characters	Mean scores
1	Age	55.21
2	Education	2.57
3	Land holding	3.16
4	Annual income	36,557
5	Social participation	1.42
6	Extension contact	1.54
7	Mass media contact	6.78
8	Cosmopoliteness	6.30
9	Extension participation	2.51
10	Scientific orientation	11.12
11	Credit orientation	4.30
12	Management orientation	4.36

Table 11: **Characters of farmers having more favourable attitude towards homestead agroforestry** n=120

Sl.No:	Characters	Mean scores
1	Age	50.43
2	Education	3.16
3	Land holding	4.51
4	Annual income	64,280
5	Social participation	2.70
6	Extension contact	2.37
7	Mass media contact	9.97
8	Cosmopoliteness	6.97
9	Extension participation	3.08
10	Scientific orientation	11.48
11	Credit orientation	4.72
12	Management orientation	5.16

attitude towards HAF was observed upto medium level. Participation by the farmers in various extension activities was also upto medium extent (1.76 – 3.07). Medium level of scientific orientation, credit orientation and management orientation were the characteristics features observed among the farmers having favourable attitude towards HAF.

Glance at Table 11 reveals that farmers having more favourable attitude towards HAF were mostly from middle to old age group. It was observed that majority of them were educated upto high school some of them were also graduates. Majority of these group constituted of small farmers (2.5 – 5 acres), some were also big farmers (5 acres and above). They had a high annual income (55,421 and above) as compared with the other two groups. High participation and involvement in various social organisation (2.5 and above) was observed among the farmers having more favourable attitude towards HAF. Farmers had high contact with extension agents (2.23 and above) with very good access to various mass media sources (9.07 and above) and were highly cosmopoliteness in nature (6.95 and above). Their participation level in various extension activities were higher (3.09 and above). High level of scientific orientation, credit orientation and management orientation were the characteristic features of the farmers having more favourable attitude towards HAF.

Table 12 : Relationship between personal and socio-psychological characteristics of homestead farmers and their perception

n = 120

Characteristics	Correlation coefficient 'r' value
Age	-0.2239 *
Education	0.3005**
Land holding	0.5973**
Annual income	0.6048**
Social participation	0.5066**
Extension contact	0.5139**
Mass media contact	0.3582**
Cosmopoliteness	0.3059**
Extension participation	0.5561**
Scientific orientation	0.5899**
Credit orientation	0.5257**
Management orientation	0.5264**

* Significant at 0.05 level
** Significant at 0.01 level

Table 13 : Relationship between personal and socio-psychological characteristics of homestead farmers and their attitude level.

n = 120

Characteristics	Correlation coefficient 'r' value
Age	-0.2230 *
Education	0.2768**
Land holding	0.5711**
Annual income	0.6113**
Social participation	0.5271**
Extension contact	0.4874**
Mass media contact	0.4897**
Cosmopoliteness	0.440**
Extension participation	0.4755**
Scientific orientation	0.3799**
Credit orientation	0.4599**
Management orientation	0.5225**

* Significant at 0.05 level
** Significant at 0.01 level

4.8 Relationship between personal and socio-psychological characteristics of homestead farmers and their perception

Correlation analysis between personal and socio-psychological characteristics of the homestead farmers and perception level was done and the findings are presented in Table 12.

Among the variables, 11 variables were positively and significantly related whereas age was negatively and significantly related with the perception level of the farmers.

4.9 Relationship between personal and socio-psychological characteristics of homestead farmers and their attitude

Correlation analysis between personal and socio-psychological characteristics of homestead farmers and their attitude level was done and results are presented in Table13.

The characteristics like education, land holding, annual income, social participation, extension contact, mass media contact, cosmopoliteness, extension participation, scientific orientation, credit orientation and management orientation were positively and significantly related to the attitude whereas age was negatively and significantly related to the attitude.

4.10 Contribution of personal and socio-psychological characteristics on perception and attitude of homestead farmers

The independent variables were analyzed for their contribution to the variation in the perception and attitude level of farmers towards homestead agroforestry.

Table 14 : Regression analysis showing factors contributing to the perception of homestead agroforestry farmer

n = 120

Variable number	Variables	Regression coefficient	S.E. of regression coefficient	't' value
Intercept		17.652	2.067	8.537
X_4	Income	1.83	1.69	1.07^{NS}
X_3	Land holdings	0.036	0.263	0.139^{NS}
X_{10}	Scientific orientation	0.205	0.145	1.409^{NS}
X_9	Extension participation	0.538	0.161	3.34**
X_{12}	Management orientation	0.213	0.073	2.90**
X_{11}	Credit orientation	-0.027	0.171	-0.146^{NS}
X_6	Extension contact	0.068	0.143	0.478^{NS}
X_5	Social participation	-0.020	0.208	-0.098^{NS}
X_7	Mass media	0.087	0.105	0.823^{NS}
X_8	Cosmopoliteness	-0.068	0.127	-0.533^{NS}
X_2	Education	-0.398	0.282	-1.410^{NS}
X_1	Age	-0.002	0.023	-0.085^{NS}

$R^2 = 0.5418$ $F_{(12,107)} = 10.54$**

Table 15 : Stepwise regression analysis showing the contribution of different variables towards perception of homestead agro-forestry farmers

n = 120

Sl. No.	Variables entering regression	Degrees of freedom	F Values	% of variation explained by regression (R^2)
1	X_4	118	70.43	0.3738
2	X_4, X_3	117	34.92	0.3740
3	X_4, X_3, X_{10}	116	26.94	0.4160
4	X_4, X_3, X_{10}, X_9	115	27.13	0.4855
5	$X_4, X_3, X_{10}, X_9 X_{12}$	114	24.96	0.5226
6	$X_4, X_3, X_{10}, X_9, X_{12}, X_{11}$	113	20.66	0.5232
7	$X_4, X_3, X_{10}, X_9, X_{12}, X_{11}, X_6$	112	17.56	0.5236
8	$X_4, X_3, X_{10}, X_9, X_{12}, X_{11}, X_6, X_5$	111	15.23	0.5253
9	$X_4, X_3, X_{10}, X_9 X_{12}, X_{11}, X_6, X_5, X_7$	110	13.62	0.5271
10	$X_4, X_3, X_{10}, X_9 X_{12}, X_{11}, X_6, X_5, X_7, X_8$	109	12.35	0.5312
11	$X_4, X_3, X_{10}, X_9 X_{12}, X_{11}, X_6, X_5, X_7, X_8, X_2$	108	11.61	0.5418
12	$X_4, X_3, X_{10}, X_9 X_{12}, X_{11}, X_6, X_5, X_7, X_8, X_2, X_1$	107	10.54	0.5424

The linear regression equation for a particular response Y (dependent variable) in terms of independent or predictors 'n' variables X_1, X_2, X_3, ----, Xn is assumed as the complete set of variables from which the equation has to be derived. The criteria for selecting a resultant equation is as follows :

To make the equation useful for predictive purpose, it is required that the model should include as many as independent variables (x) as possible so that reliable fitted values can be determined.

The stepwise regression analysis in one of the powerful statistical procedures for accomplishing the desired statistical results.

In the present study also, the technique of stepwise regression analysis was carried out to select the best suited regression equation and thereby identify the best variables out of the existing variables for predicting the utmost variation in perception and attitude of farmers towards homestead agroforestry. The results are presented under the following heading.

4.10.1 Relative importance of independent variables in explaining the variation in perception of farmers' towards homestead agroforestry

Table 15 presents the results of the stepwise regression analysis which depict the steps included in the perception level of homestead farmers. From the table it could be inferred that the first step includes only one variable, annual income (X_4) which could explain more than 37 per cent of variation in perception of farmers. Incorporating the variables land holding (X_3) and

Table 16 : Regression analysis showing factors contributing to the attitude level of homestead agroforestry farmers

n = 120

Variable number	Variables	Regression coefficient	S.E. of regression coefficient	't' value
Intercept		31.958	3.254	9.81
X_4	Income	9.20	2.66	0.034^{NS}
X_3	Land holdings	0.567	0.415	1.365^{NS}
X_{10}	Scientific orientation	-0.244	0.166	-1.468^{NS}
X_9	Extension participation	-0.009	0.327	-0.029^{NS}
X_{12}	Management orientation	0.325	0.225	1.442^{NS}
X_{11}	Credit orientation	0.397	0.228	1.736^{NS}
X_6	Extention contact	0.031	0.300	0.105^{NS}
X_5	Social participation	0.648	0.200	3.226**
X_7	Mass media	0.515	0.253	2.030**
X_8	Cosmopoliteness	0.048	0.115	-1.468^{NS}
X_2	Education	-0.285	0.444	-0.642^{NS}
X_1	Age	0.004	0.037	0.131^{NS}

$R^2 = 0.5620$ $F_{(10,107)} = 11.444$**

Table 17 : Stepwise regression analysis showing the contribution of different variables towards attitude level of homestead agro-forestry farmers

n = 120

Sl. No.	Variables entering regression	Degrees of freedom	F Values	% of variation explained by regression (R^2)
1	X_4	118	68.06	0.3658
2	X_4, X_3	117	34.98	0.3742
3	X_4, X_3, X_5	116	34.28	0.4700
4	X_4, X_3, X_5, X_{12}	115	30.22	0.5124
5	$X_4, X_3, X_5, X_{12} X_7$	114	26.79	0.5402
6	$X_4, X_3, X_5, X_{12} X_7, X_6$	113	22.13	0.5403
7	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9$	112	18.82	0.5405
8	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9, X_{11}$	111	17.00	0.5406
9	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9, X_{11}, X_8$	110	15.02	0.5513
10	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9, X_{11}, X_8, X_{10}$	109	13.83	0.5593
11	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9, X_{11}, X_8, X_{10}, X_2$	108	12.59	0.5620
12	$X_4, X_3, X_5, X_{12} X_7, X_6, X_9, X_{11}, X_8, X_{10}, X_2, X_1$	107	11.44	0.5629

scientific orientation (X_{10}), under second and third step results in more than 41 per cent of variation in perception of homestead farmers. More than 54 per cent of variation in perception is explained by variables like annual income (X_4), land holding (X_3), scientific orientation (X_{10}), extension participation (X_9), management orientation (X_{12}), credit orientation (X_{11}), extension contact (X_6), social participation (X_5), mass media contact (X_7), cosmopoliteness (X_8), education (X_2) and age (X_1). The F value (F = 10.54) was found to be significant at one per cent level. The regression coefficient (b), standard error of regression coefficient and t value are given in Table 14.

It is also clear from the table that income (X_4) and land holding (X_3) were the most important variables followed by scientific orientation (X_{10}), extension participation (X_9), management orientation (X_{12}), credit orientation (X_{11}), extension contact (X_6), social participation (X_5), Mass media contact (X_7), cosmopoliteness (X_8), education (X_2) and age (X_1). Thus, these variables in the above order contributed more than 54 per cent of variation in the perception level of farmers' towards homestead agroforestry.

4.10.2 Relative importance of independent variables in explaining the variation in attitude level of farmers' towards homestead agroforestry

Table 17 presents the results of stepwise regression analysis showing the factors influencing the attitude level of homestead farmers. The factors are presented in their decreasing order of importance in explaining the variation in

the attitude level of homestead farmers. A single factor in the first step i.e., income alone contributed more than 36 per cent of variation in the attitude of farmers towards homestead agroforestry. It is followed by land holding (X_3), social participation (X_5), management orientation (X_{12}), mass media (X_7), extension contact (X_6), extension participation (X_9) , credit orientation (X_{11}) , cosmopoliteness (X_8) , scientific orientation (X_{10}), education (X_2) and age (X_1) which totally contributes more than 56 per cent of the variation in the attitude level of homestead farmers.

The percentage variation in the dependent variable, explained by the value of R^2 and the order of inclusion of variables under each step are presented in Table 16. The F value (F = 11.44) was found significant which indicated the significance of regression equation in predicting the attitude level of homestead farmers. Computed regression coefficients, standard error and 't' values for the included variables under stepwise are shown in Table 16.

4.11 Crop diversity in homestead gardens

From Table 18 it is very clear that among the plantation crops, 100 per cent of the farmers had coconut trees in their homestead followed by 79 per cent of arecanut, 69 per cent of cashew and 33 per cent of rubber trees.

A cursory glance of table reveals that majority of the fruit crops grown by farmers were Banana (99 per cent), Mango (95 per cent), Papaya (90 per cent), Jack (76 per cent), Guava (71 per cent) followed by 55 per cent of sapota

Table 18 : Crop diversity in homestead

Sl. No.	Plantation crops	N	%
1.	Coconut (*Cocos nucifera)*	120	100
2.	Arecanut (*Areca catechu*)	95	79
3.	Cashew (*Anacardium oxidentale*)	8	7
4.	Rubber (*Hevea braziliensis*)	33	27
	Fruit crops		
1.	Mango (*Mangifera indica*)	114	95
2.	Jack (*Artrocarpus heterophyllus)*	92	76
3.	Banana (*Musa sp.*)	119	99
4.	Star apple (*Syzygium javanica*)	22	18
5.	Guava (*Psidium guajava*)	85	71
6.	Sapota (*Acrus sapota*)	66	55
7.	Papaya (*Carica papaya*)	109	90
8.	Pineapple (*Ananas comosus*)	65	54
9.	Aonla (*Phyllanthus emblica*)	43	36
10.	Lov-Lovi (*Flucorlia inermis*)	36	30
11.	Jamba (*Eugenia jambos*)	41	34
12.	Bilimbi (*Avorrhoa carambola*)	38	32
13.	Anona (*Anona sp.*)	37	31
14.	Pomegranate (*Punicum granatum*)	17	14
15.	Passion fruit (*Paniflora edulis*)	33	27
16.	Lime (*Citrus aurantifolia*)	32	26
	Vegetables, tuber and pulses		
1.	Vegetables	118	98
2.	Amorphophallus	87	72
3.	Colocasia	86	71
4.	Tapioca (*Manihot esculenta*)	65	54
5.	Arrow root (*Maranda arundanacea*)	47	39
6.	Bread fruit (*Astrocarpus altilis*)	56	47

Sl. No.		N	%
7.	Cow pea (*Vigna ungiculata*)	70	58
8.	Green gram (*Phaseolus aureus*)	41	34
9.	Drumstick (*Moringa tinctoria*)	83	60
10.	Sweet poato (*Ipomea batatas*)	37	31
11.	Dioscorea	16	13
	Spices		
1.	Pepper (*Piper nigrum*)	100	83
2.	Nutmeg (*Myristica fragrans*)	64	53
3.	Clove (*Eugenia caryophyllus*)	45	37
4.	Curry leaf (*Murraya koengii*)	111	92
5.	Ginger (*Zangiber officinalis*)	63	52
6.	Turmeric (*Curcuma longa*)	47	39
7.	Cinnamon (*Cinnamonsum zylanicum*)	34	28
8.	Cardamom (*Elettaria cardamonsum*)	10	8
9.	Sesamum (*Sesamum indicum*)	20	17
10.	Flavour leaf (*Cinnanomum sulphuratum*)	2	2
	Medicinal crops		
1.	Neem (*Azidiracta indica*)	67	56
2.	Tulasi (*Ocimum sanctum*)	103	86
3.	Kuvalam (*Aegles marmalor*)	27	22
4.	Keeyanalli (*Phyllanthus neruri*)	43	36
5.	Karinochi (*Vitex negunelo*)	47	39
6.	Vadamkoli (*Justicia gendarusa*)	15	12
7.	Chakrakoli (*Gymnema silvestre*)	12	10
8.	Malanthagi (*Andrographis paniaclata*)	17	14
9.	Thayuthama (*Boerhavia diffusa*)	37	31
10.	Mylangi (*Lausonia inermis*)	6	5
11.	Muell (*Adathoda vesica*)	8	7

Sl. No.	Fodder crops	N	%
1.	Glyricidia (*Glyricidia maculata*)	100	83
2.	Calapagonium	21	17
3.	Sun-hemp (*Crotalaria junctea*)	6	5
4.	Guenea gran	17	14
5.	Other fodders	6	5
	Tree species		
1.	Tamarind (*Tamarindus indica*)	90	75
2.	Teak (*Tectona grandis*)	82	68
3.	Greek poplar (*Thespecia populnea*)	28	23
4.	Bamboo (*Bambusa* sp.)	26	21
5.	Silk cotton tree (*Bambox malataricum*)	6	5
6.	Marithu (*Terminalia indica*)	32	27
7.	Rose wood (*Dalbergia sisoo*)	40	33
8.	Mandaram (*Bouhinia* sp.)	27	23
9.	Adamaram (*Tarminalia catappa*)	14	12
10.	Sandalwood (*Sandalum album*)	14	12
11.	Mahagony (*Swieitenia mahogony*)	14	12
12.	Raintree (Samania samam)	6	5
13.	Venga (*Pterocarpus marsuipium*)	41	34
14.	Vatta (*Macaranga peltata*)	20	17
15.	Elanji (*Mimosops elanjii*)	17	14
16.	Erythrina (*Erythrina indica*)	8	7
17.	Mahua (*Madhuca indica*)	4	3
18.	Mangium (*Acacia mangium*)	25	21
19.	Perumaram (*Ailanthus excelsa*)	28	23
20.	Ayani (*Astrocarpus hirsuta*)	4	3
21.	Kumbi (*Careya arborea*)	7	6
22.	Albizia (*Albizia falcataria*)	35	29
23.	Pogoda (*Plumaria alba*)	18	15
24.	Chembaka (*Michelia chembaka*)	4	3

Sl. No.		N	%
25	Pala (*Alstonia sholaris*)	22	18
26.	Kodampully (*Garcinia cambogia*)	3	2.5
27.	Cannonboll tree (*Cauropita guinensis*)	41	34
28.	Carsia (*Carsia* sp.)	5	4
29.	Anjily (*Astrocarpus hirsuta*)	66	55
30.	Ficus (*Ficus* sp)	7	6
31.	Pong (*Pongamia glabra*)	7	6
32.	Kapok (*Ceiba pentandra*)	8	7

and pineapple (54 per cent). The number of per centages of other fruit crops grown by farmers are listed in Table 18.

A perusal of table 18 reveals that majority of the farmers i.e., 98 per cent had vegetables in their farm, equal per centage i.e., 72 per cent had amorphophallus and colocaria.

A close look at the table reveals that among spices, pepper was grown by majority (83 per cent) of farmers followed by nutmeg (53 per cent), ginger (52 per cent), turmeric (39 per cent) etc.

An examination of table 18 shows that tulasi and neem were found in majority (i.e., 85 per cent and 55 per cent) of the homesteads followed by *Vitex negundo* (39 per cent), *Phyllanthus neruri* (35 per cent) etc.

From the table, it could be inferred that among the fodder category *Glyricidia Sp.* was adopted by majority (83 per cent) of farmers, followed by calapagonium and guinea grass by 18 per cent and 16 per cent of farmers.

Table indicates that among the tree sp. the most preferred one by majority (i.e., 75 per cent) of farmers was Tamarind. Next came teak with 68 per cent of preference and anjily with 53 per cent of preference. The number and percentages of other tree species grown by the farmers are listed in Table 18.

Different crops species commonly found in homestead of Kerala are shown in Plates 3 to 6.

Some of forest and other tree species were found distributed in 'Kavus'. 'Sacred grooves' or 'Kavus' are tracts of virigin forests. These 'Kavus' of Kerala although limited in area are found to be distinct and unique in their biological diversity and eco-system functioning. 'Kavus' of Kerala are shown in Plate No. 7 & 8.

Multistoried canopy configuration of crops in homegarden of Kerala

Plate 3 : View of lower canopy of crops in homegarden

Plate 4 : View of upper canopy of crops in homegarden

Plate 5 : Dense canopy of different crops species in homegarden

Plate 6 : Crop diversity in homestead gardens

Plate 7 & 8 : Different views of 'Sacred grooves' or 'Kavus' in Kerala

Table 19 : Range of crop species based on land holding size

n = 120

Land holding	Range of crop species
< 2.5 acres	17-43
2.5 – 5 acres	16-47
> 5 acres	35-51

Table 20 : Classification of crop diversity in homestead gardens based on land holding

Crops

n = 120

Characteristic	Category	Low		Medium		High		Total		X^2
		N	%	N	%	N	%	N	%	
Land holding	Big farmers	0	0	2	14	12	86	14	12	40.25*
	Small farmers	11	19	26	46	20	35	57	47	
	Marginal farmers	28	57	15	29	7	14	49	41	
	Total	39	32	43	36	39	32	120	100	

** Significant at 0.01 level

Table 21 : Classification of profitability based on crop diversity in homestead gardens

Profits

n = 120

Characteristic	Category	Low		Medium		High		Total		X^2
		N	%	N	%	N	%	N	%	
Crops	Low diversity	29	67	14	32	0	0	43	36	62.83*
	Medium diversity	11	29	24	63	3	8	38	32	
	High diversity	1	2	16	50	22	56	39	32	
	Total	41	34	54	45	25	21	120	100	

** Significant at 0.01 level

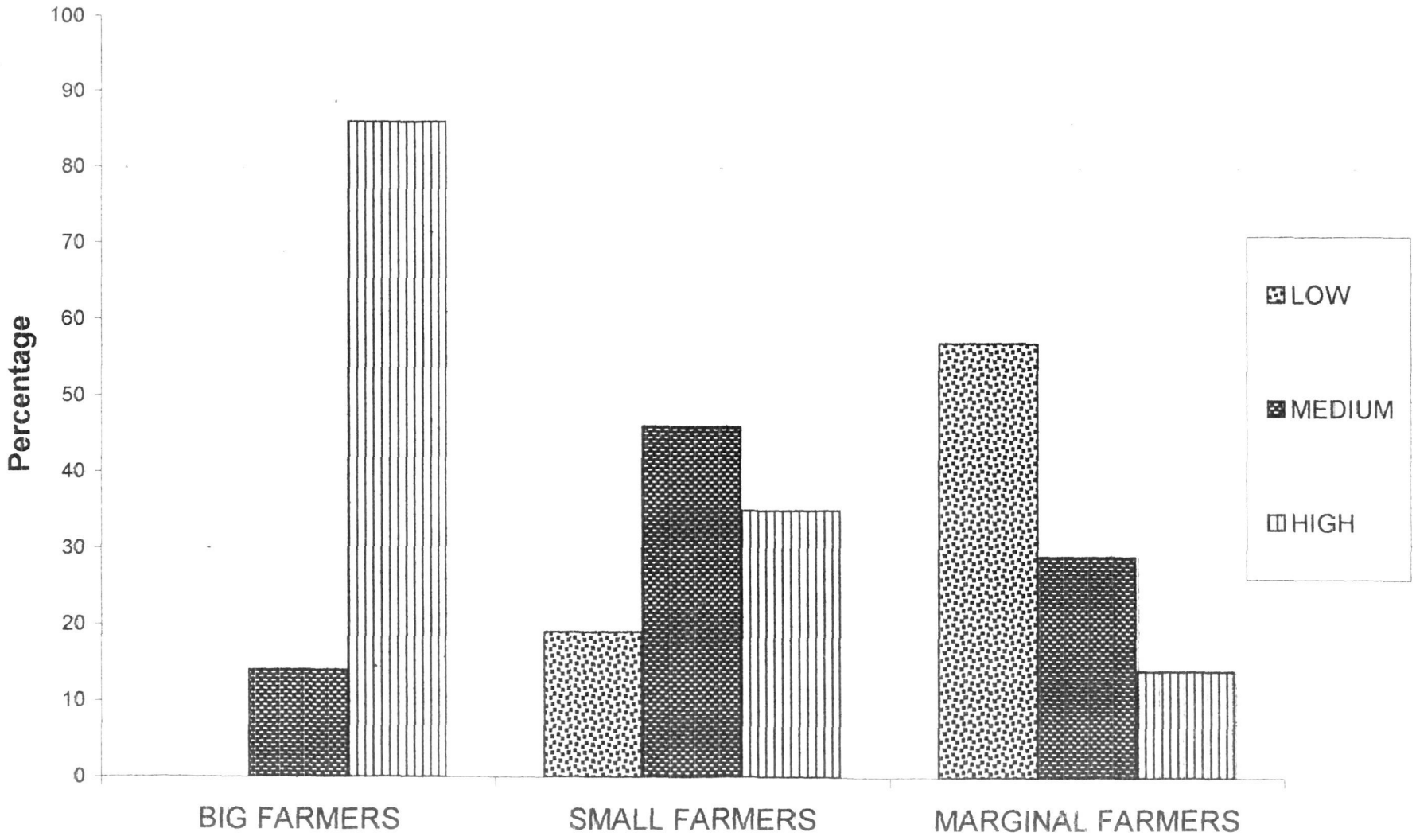


Fig 12: Crop diversity in homestead gardens among different categories of farmers

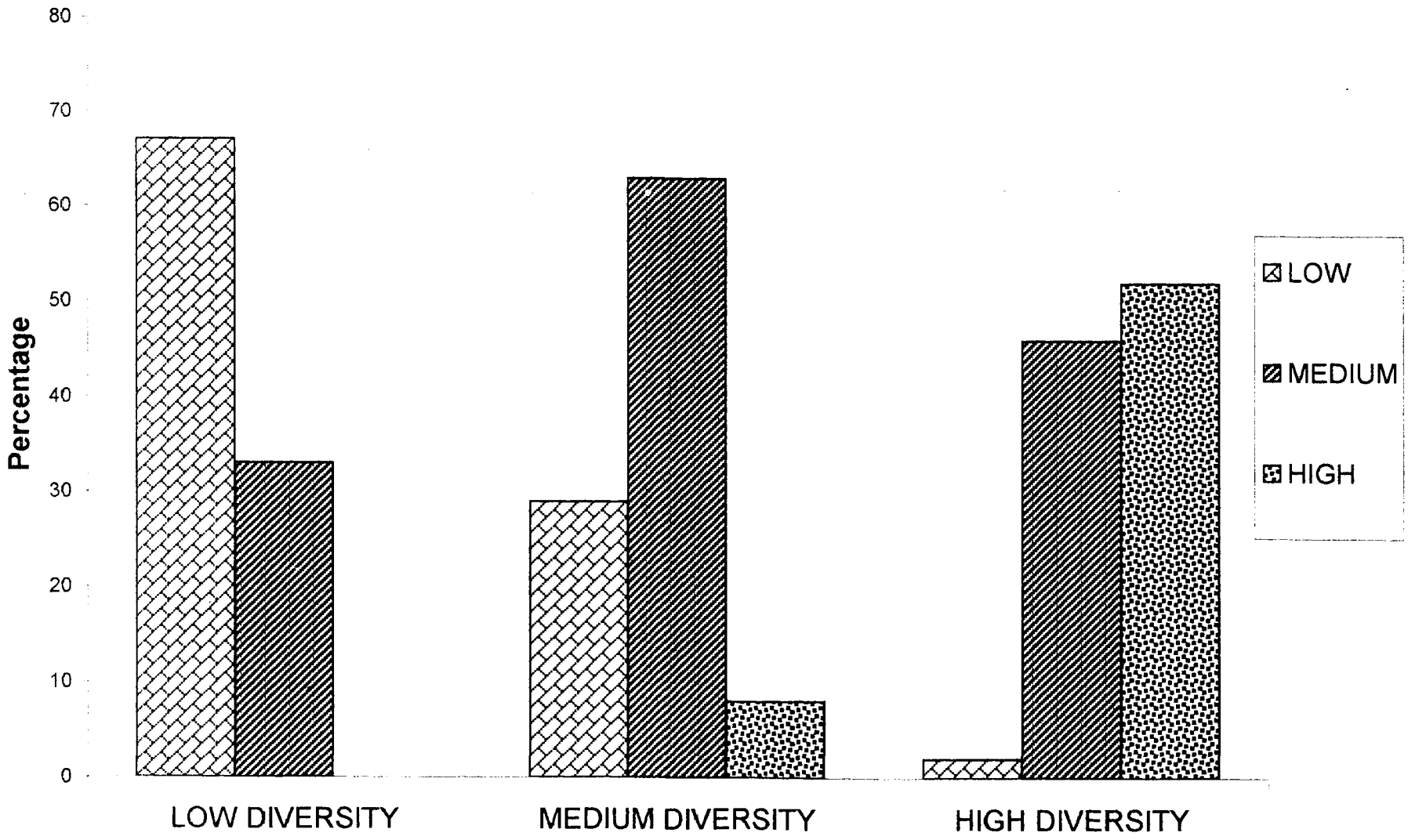


Fig 13: Profitability in homestead gardens with different crop diversity

4.12 Range of crop species in different sizes of land holding

It can be noted from table 19 that marginal farmers (i.e., with less than 2.5 acres) had a range of 17-43 crop species in their farm. In case of small farmers (2.5 – 5 acres) 16-47 range of species was observed while the range in case of big farmers (i.e., > 5 acres) were 35-51.

4.13 Classification of crop diversity based on land holding

Table 20 reveals that among big farmers 86 per cent had high crop diversity and rest of 14 per cent had medium crop diversity in their homestead farms.

Further, it could be seen that among small farmers 46 per cent had medium crop diversity, followed in by 35 per cent had high diversity and 19 per cent had low diversity. In case of marginal farmers, majority (57per cent) had low crop diversity followed by 28 per cent of medium diversity and 14 per cent of high diversity. Chi square analysis shows that there is significant association between land holding and crop diversity.

4.14 Classification of profit level based on species diversity

A cursory glance at Table 21 reveals that in the category of farmers having maximum crop diversity, majority (56 per cent) had high profit, whereas 50 per cent had medium and only 2 per cent earned low profit.

Table 22 : Classification of profit based on land holding

Profits

n = 120

Characteristic	Category	Low		Medium		High		Total		X^2
		N	%	N	%	N	%	N	%	
Land holding	Big farmers	0	0	1	7	13	92	14	100	80.6*
	Small farmers	9	16	36	69	11	19	56	100	
	Marginal farmers	32	64	18	36	0	0	50	100	
	Total	41	34	55	46	24	20	120	100	

* Significant at 0.01 level

Table 23 : Classification of profit based on livestock

Profits n = 120

Characteristic	Category	Low		Medium		High		Total		X^2
		N	%	N	%	N	%	N	%	
Livestock	High	5	13	15	40	17	45	37	100	12.98*
	Medium	6	18	17	53	9	28	32	100	
	Low	20	39	22	93	9	17	50	100	
	Total	41	34	55	46	24	20	120	100	

* Significant at 0.01 level

Further, it was seen that in case of farmers with medium crop diversity, 63 per cent of farmers earned medium profit while 29 per cent had low and only 8 per cent had high profit. In case of group with low crop diversity majority (67 per cent) had low profit and the rest 32 per cent had medium profit. Chi square analysis shows that there is significant association between profit and crop diversity.

4.15 Classification of profit level based on land holding

It can be concluded from Table 22 that majority (92 per cent) of big farmers had high profit and the rest 7 per cent had medium profit, whereas in case of small farmers, majority (64 per cent) had medium profit followed by 19 per cent earned high profit and 16 per cent got low profit. In case of marginal farmers (64 per cent) had low profit and rest 36 per cent had medium profit. Chi square analysis shows that there is significant association between land holding and profit.

4.16 Classification of profit based on livestock possession

From Table 23, it can be concluded that 45 per cent of farmers had high profit, 40 per cent medium profit and 13 per cent had low profit among 'high livestock possession category'. In case of 'medium category' 53 per cent had medium profit, 28 per cent had high profit and 18 per cent had low profit. Among 'low livestock possession category', majority had medium profit (43 per cent) followed by 39 per cent of low profit and 17 per cent of high profit.

Table 24 : Relationship between land holding, crops and livestock with gross returns

n = 120

Characteristics	'r' value
Land holding	0.93*
Crops	0.71*
Livestock	0.64*

* Significant at 0.01 level

Table 25 : Determinants of gross returns in Homstead agro-forestry

n = 120

Variables	Regression coefficient	SE of regression coefficient	't' value
Intercept	-26841	3762.8	-7.133
Land holding	13399.9	817.26	16.39*
Crops	570.54	146.63	3.89*
Livestock	358.12	120.93	2.96*

$R^2 = 0.89$ F = 32.38*

* Significant at 0.01 level

Table 26 : Relationship between different crop groups with gross returns

n = 120

Crop groups	Correlation coefficient ('r' value)
Plantation	0.483*
Fruits	0.335*
Vegetables, tuber pulses	0.429*
Spice	0.625*
Medicinal plants	0.500*
Fodder	0.369*
Forest	0.501*

* Significant at 0.01 level

Table 27 : Multiple regression analysis of selected crop groups with gross returns

n = 120

Crop groups	Regression coefficient	SE of regression coefficient	't' value
Intercept	-46743.2	9488.409	-4.92635**
Plantation	8700.741	2720.17	3.1986**
Fruits	1841.035	940.9851	1.9764*
Vegetables, tuber, pulses	1742.956	978.366	1.9814*
Spices	3920.333	1489.512	2.6319**
Medicinal plants	3053.803	1546.745	1.1243*
Fodder	3777.167	2542.864	1.1853^{NS}
Forest sp.	1272.109	814.1417	1.5625^{NS}

$R^2 = 0.5589$ F = 20.2807*

* Significant at 0.05 level

** Significant at 0.01 level

4.17 Relationship between land holding crops and livestock with gross returns

Table 24 reveals that all the three variables i.e. land holding, crops and livestock were positively and significantly correlated with gross returns.

4.18 Determinants of gross returns in homestead agroforestry.

The multiple regression analysis results presented in Table 25 revealed that 89 per cent of variations in gross returns was explained by land holding, crops and livestock. The F value was significant at one per cent level of probability. Further, it was revealed that land holding had significant contribution towards gross returns.

4.19 Relationship between different crop groups with gross returns

An examination of Table 26 reveals that all crops groups i.e., plantation, fruits, vegetables, tuber, pulses. Species, medicinal plants, fodder, tree sp. are positively and significantly correlated with gross returns.

4.20 Contribution of crops on gross returns in homestead agroforestry.

The multiple regression analysis results presented in Table 27 reveals that 55 per cent of variation in gross returns was explained by different crop groups like plantation, fruits, vegetables, tuber, pulses, spices, medicinal plants, fodder and forest sp. The F value was significant at 0.01 per cent level

Table 28 : Marketing channels used by the homestead farmers

n = 120

Sl. No.	Channel	%
1.	Direct	65
2.	Middle men	24
3.	Co-operative society	10

Table 29 : Constraints faced by farmers in practicing homestead agroforestry

n = 120

Sl. No.	Constraints	Rank	Percent
1.	Unavailability of planting materials	I	59
2.	Stringent laws on marketing of homestead produce	II	33
3.	Deep rooting habit of certain trees	III	27
4.	Uncertainity about produce from trees	IV	19
5.	Smaller size of land holding	V	17
6.	Long gestation period	VI	16
7.	Non-availability of water	VII	12
8.	Tree species deplete soil nutrients	VIII	2

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C1 Unavailability of planting materials

C2 Stringent laws on marketing of homestead produce

C3 Deep rooting habit of certain trees

C4 Uncertainity about produce from trees

C5 Smaller size of land holding

C6 Long gestation period

C7 Non-availability of water

C8 Tree species deplete soil nutrients

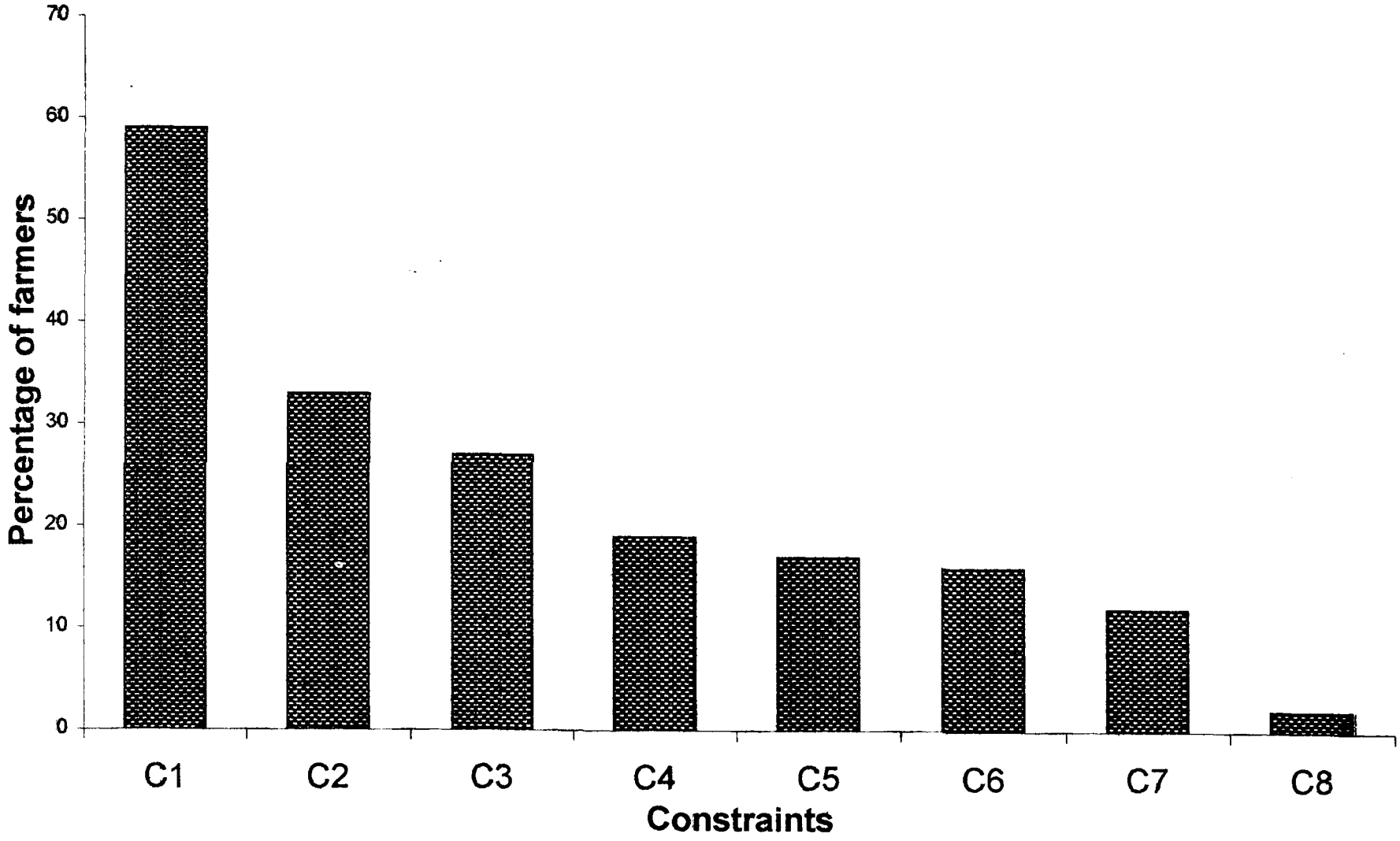

Fig 14: Constraints faced by homestead agroforestry farmers

of profitability. Further, it was revealed that plantation followed by spices and fruits has significant contribution towards gross returns.

4.21 Marketing channels adopted by farmers

From Table 28, it can be concluded that majority (65 per cent) of the farmers marketed their produce directly.

24 per cent sort the help of middle men for marketing their produce, while 10 per cent took the help of co-operative societies.

4.22 Constraints faced by the farmers in practicing homestead agro forestry

It was observed from Table 29 that major constraint faced by majority (59 per cent) of farmers was non-availability of planting material. 33 per cent of farmers have reported government laws as a constraint regarding the marketing of homestead produce. Deep rooting habit of certain trees was reported as a constraint by 27 per cent of farmers followed by uncertainity of the yield by 19 per cent, smaller size of land holding by 17 per cent, long gestation periods of some tree species by 16 per cent and shortage of water by 12 per cent. The least observed constraint (i.e., 2 per cent) faced by the farmers was depletion of soil nutrients by tree sp.

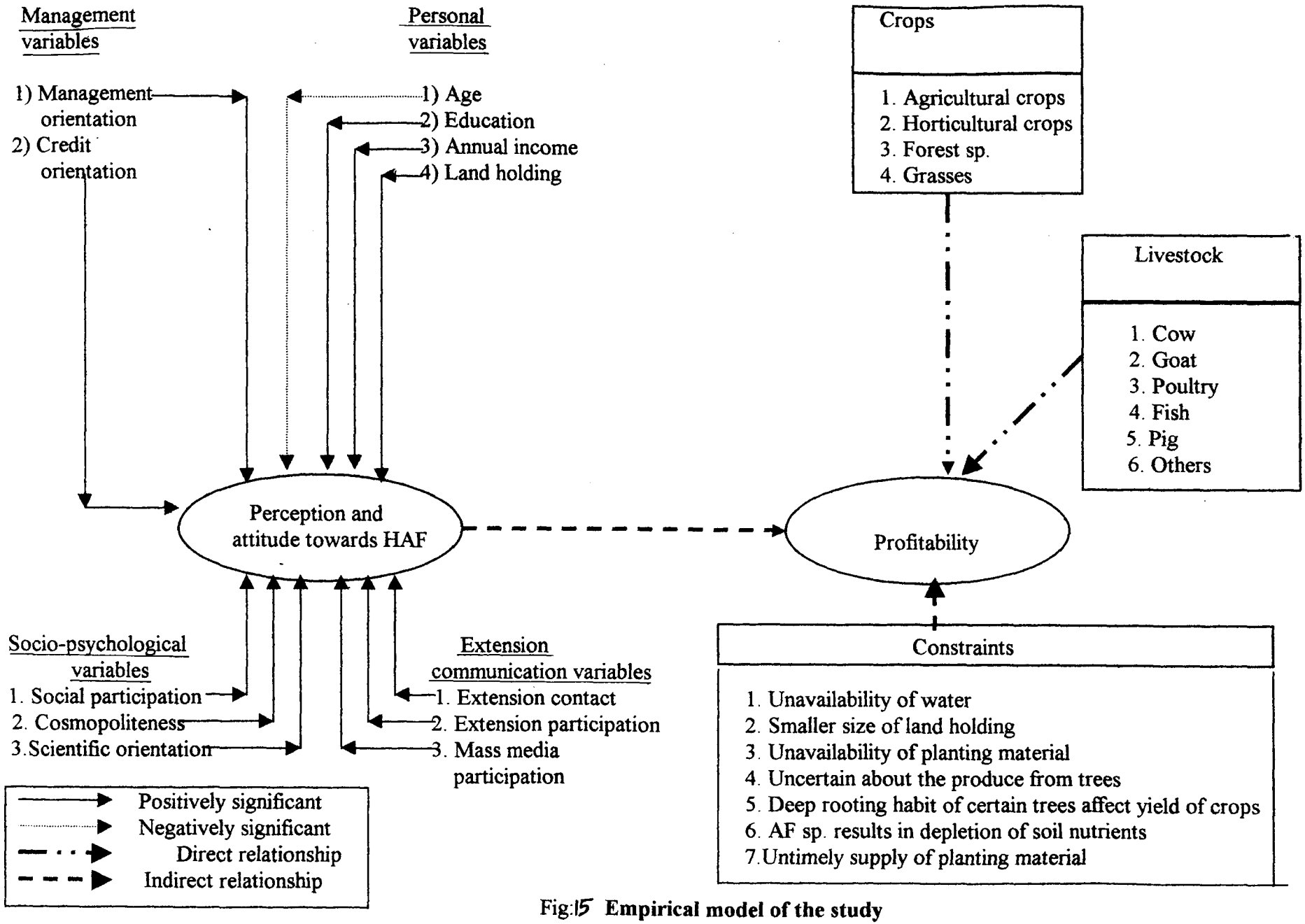

Fig:15 **Empirical model of the study**

4.23 Empirical model of the study

The study was conducted to determine farmers' perception and attitude towards HAF system in Kerala. Among the 12 variables education, land holding, annual income, social participation, extension contact, mass media contact, cosmopoliteness, extension participation, scientific orientation, credit orientation and management orientation were positively and significantly related to both perception and attitude. Whereas age had negative and significant relationship with both dependent variables.

Profitability in homestead is a multi dimensional concept. Perception and attitude had an indirect influence on profitability. Among the other items that influenced the profit level of homestead agro forestry farmers are crops and livestock which exhibit a direct effect, whereas constraints had an indirect effect on it.

DISCUSSION

V. DISCUSSION

The results of the study are discussed in this chapter under the following headings :

5.1 Characteristic profile of homestead agroforestry farmers

5.2 Overall perception of farmers towards homestead agroforestry

5.3 Classification of perception of homestead agroforestry farmers based on their personal and socio-psychological variables

5.4 Characters of farmers having low perception, medium perception and high perception towards homestead agroforestry

5.5 Overall attitude of farmers towards homestead agroforestry

5.6 Classification of attitude of homestead agroforestry farmers based on personal and socio-psychological variables

5.7 Characters of farmers having less favourable, favourable and more favourable attitude towards homestead agroforestry

5.8 Relationship between personal and socio-psychological characteristics of homestead agroforestry and their perception

5.9 Relation between personal and socio-psychological characteristics of homestead farmers and their attitude

5.10 Contribution of personal and socio-psychological characteristics with perception and attitude of homestead farmers.

5.11 Crop diversity in the homestead farms.

5.12 Range of crop species in different sizes of land holding.

5.13 Classification of crop diversity based on land holding

5.14 Classification of profit level based on crop diversity

5.15 Classification of profit level based on land holding.

5.16 Classification of profit level based on livestock

5.1 Characteristic profile of homestead farmers

The data regarding personal and socio-psychological characteristics of farmers have revealed certain important findings.

With respect to age, majority of the farmers belonged to middle age and older age groups. This may be due to the trend adopted by the youngsters to opt professions other than farming as most of them aspire for white collar jobs.

Nearly one third had medium to high level education, this may be due to prime importance given to education in Kerala as it a 100 per cent literate state.

It was noted that majority i.e., greater than one third belonged to marginal and small farmers category may be because of the fact that Kerala is the most densely populated states in India, population density of the state and country were 655 and 216 persons / km^2 respectively according to 1981 census. Hence, the per capita availability of land is very less in Kerala when compared to other states.

Majority of farmers belonged to high to medium level income group. It's quite obvious as homesteads consists of multitude of crops presenting a multitier canopy configuration along with livestock which ensures high level of exploitation of environmental resources and thus increases the income and reduces risk of crop failure.

Even after implementing of people's plan in Kerala, only medium social participation was observed, this may be due to various lacunas that unable the farmers to participate in different committees like padashekara committee, parapadam, panchayat etc.

Medium to low extension contact was observed. This can be attributed to the failure of the rapport and contact between the extension officials and farmers.

Nearly one third of farmers had medium to high mass media contact, this might be due to print and electronic media which are becoming very popular among the farmers to a greater extent.

Majority of farmers had medium to high level of cosmopoliteness, which could be due to eagerness of gathering information, to learn more and to acquaint themselves thoroughly with their occupation.

Low to medium level of extension participation by the farmer was observed which could be do due to low extension contact with the extension agencies or poor organisation of extension programmes.

Greater than one third of the farmers had medium to high scientific orientation. Plausible reason might be that the farmers are more responsive to the latest technology, more idealistic to ensure high income by better utilization of natural resources scientifically.

Majority of the farmers had high to medium credit orientation, the reason could be implied here is that the respondents with progressive values will generally use credit. It could be inferred that majority of farmers had high management orientation as they had to be utmost careful in sowing of crops to avoid shade problem and in selection of crop species also as to avoid competition between any of the two species.

5.2 Overall perception of farmers towards homestead agroforestry

From Table 2, it can be inferred that majority of the farmers had medium to high perception towards HAF. This may be due to the functional diversity of home gardens as it performs a variety of roles and fulfil various functions of the farm family and the community therein. This synergistic interaction between the crops and livestock components resulted in higher productivity, profitability and sustainability of the system as a whole. Hence this paves way better for perception.

5.3 Classification of perception of homestead agroforestry farmers based on personal socio-psychological variables

5.3.1 Perception and age of homestead agroforestry farmers

Data from Table 3a reveals that there is difference between different age group of farmers and their perception level. Majority of the 'young' and 'middle aged farmers' had very high perception as compared to the 'old age group' where majority had medium to low perception. This can be attributed to their venturesome nature, moreover the 'young'and 'middle age group' are more educated which widens their perception towards various objects where as, 'old age farmers' might have become less enthusiastic.

The findings are in contrast to the findings of Nimbalkar and Pawar (1990), Patil (1994), Padmaiah (1995).

5.3.2 Perception and education

It could be inferred from Table 3b that the perception level of farmers belonging to different educational categories is different. Majority of farmers from 'higher education category' had high perception whereas farmers in 'medium' and 'low categories' had medium to low perception. The possible reason for this could be that education facilitates learning in order to take advantage of opportunities. Thus increases the perception of farmers and helps them to widen their perspective evaluation.

The findings are in accordance with the findings of Ratnakar and Reddy (1991), Padmaiah (1995), Padmaiah and Ansari (1997).

5.3.3 Perception and land holding

Cursory look at Table 3c reveals that there is difference in perception among the marginal, small and large farmers. Majority of marginal farmers had low while majority of small farmers had medium perception. Whereas in case of large farmers greater than one third had high perception. Plausible reason is that individuals having larger holdings are usually interested to grow different species which inturn provides high income, thus making them economically sound and hence are better positioned than farmers with small holdings. Higher land holding status operates through the financial strength leading to better perception.

The findings of the study are consistent with the results reported by Patil (1994), Arulraj and Ulapaladan (1995).

5.3.4 Perception and annual income

A close look at Table 3d revealed that the differences in the perception level of different income group of farmers was significant i.e., from the high and medium income group of farmers, a greater than one third of farmers had high perception whereas low income group exhibited medium to high perception. The probable cause might be that the persons with more resources are in a better position to acquire more information through formal or informal education which enable them to have better perception.

The findings contradict the findings of the study conducted by Nimbalkar and Pawar (1990), Patil (1994) and Padmaiah (1995).

5.3.5 Perception and social participation

It is quite obvious from Table 3e that perception varies with the extent of participation. Majority of farmers from the 'high' and 'medium social participation category' had very high to medium perception whereas farmers from 'low social participation category'' exhibited low perception. It is quite natural as farmers having membership in social organizations had more chance of getting exposed to different sources of information, which in turn helped them to gain better perception.

5.3.6 Perception and extension contact

An examination of Table 3f reveals that extension contact is directly proportional to perception i.e. with an increase in extension contact a corresponding increase in perception was observed. As majority of farmers with 'high' and 'medium extension contact' had high to medium perception and vice versa in case of 'low extension contact farmers'. The reasons for this is that increase in extension contact must have resulted in participation of farmers in several extension activities involving different learning experiences. Obviously this must have paved the way for better perception.

The results obtained here are inconsistent with the results reported by Ratnakar and Reddy (1991), Patil (1994), Arulraj and Ulagalandan (1995), whereas Sudheendra (1986) have reported findings which are dissimilar to the present findings.

5.3.7 Perception and mass-media

Data from Table 3g reveals that the differences in perception level of different mass media contact category is found to be significant, indicating that farmers of 'high' and 'medium mass media contact category' had high to medium perception respectively, where as farmers with 'low mass media contact' had low perception. Thus, mass media plays significant role in the spreading of new ideas among farmers and provide opportunities for repeated exposure to new technologies and motivate them towards positive action. In Kerala, majority of the farm families subscribe newspaper and own radio. They value this mass -media as a major source of agricultural information. Due to repeated exposure to these sources, they might have developed better perception.

The findings of the study are in confirmity with the findings reported by Nimbalkar and Pawar (1990), Patil (1994) and is in contrast with the findings of Sudheendra (1986), Ratnakar and Reddy (1991), Padmaiah (1995).

5.3.8 Perception and cosmopoliteness

A glance at Table 3 h reveals that majority of the farmers from 'high' and 'medium cosmopolite category' had high to medium perception whereas in low cosmopolite category' the majority had low perception. The farmers had frequent contact with individuals outside their social system. This cosmopoliteness does provide opportunity for interpersonal communication with people outside. Thus, they are more likely to get cues regarding improved technology which leads to better perception.. In the words of Merton (1968), the cosmopolitans have extra local interest whereas the locals were more immediately concerned with direct interpersonal relation. The one tends to read about the great world outside, while the other to act in the little world inside.

The findings of this study was in accordance with the research study reported by Ratnakar and Reddy (1991) and in contrast with the findings of Viju and Pillai(1988).

5.3.9 Perception and extension participation

Table 3i reveals that there is significant difference between perception level of homestead agroforestry farmers and extension participation. It could be inferred that with the increase in extension participation there is simultaneous increase in perception.

Participation in extension activities provide opportunities for them to discuss with scientists, extension officers, fertilizer and pesticides agents and

other progressive farmers with whom they can exchange their ideas. This in turn provides for contrived experience and serve as reinforcement in gaining knowledge which leads to better perception of facts.

Other possible reasons may be due to the large number of extension activities conducted by the Peoples plan in Kerala which consists of good quality programme that have attracted farmers, leading to better perception.

5.3.10 Perception and scientific orientation

Table 3j reveals that perception differed significantly with scientific orientation level of farmers i.e., farmers with high scientific orientation had high perception and those with low scientific orientation had low perception. The reason may be that the farmers with high scientific orientation must have always tried to acquire more information regarding innovations, evaluate it objectively and must have adopted the innovation in their farms at a faster rate. They must have taken this as prestige.

Findings are in consistent with the findings of Ingle and Virkhare (1988).

5.3.11 Perception and credit orientation

A critical analysis of Table 3k reveals that among 'high credit orientation category', majority had high perception, majority of 'medium category' had medium perception and 'low category' had low perception.

Reason may be that by adopting improved agricultural technology, the farmers can get maximum productivity from the various crop species and animal enterprises in home gardens, thus he will be in better position to repay the loan.

The findings are in accordance with that of Padmaiah (1995) and is contrast with Patil (1994).

5.3.12 Perception and management orientation

It could be inferred from Table 31 that there is significant difference in perception between farmers belonging to different management orientation group. Majority of farmers with high to medium management orientation had medium to high whereas farmers with low management orientation had low perception. The reason might be that in homegarden planning, production and marketing of agricultural produce has to be done under different situations. Farmers due to their interaction with people, develop a capacity of understanding their problems clearly and will be in a better position to know the merits and demerits of new technologies. This inturn, increases their perception.

5.4 Characters of farmers having low, medium and high perception towards homestead agroforestry system in Kerala

5.4.1 Characters of farmers having low perception

From Table 4, it can be inferred that farmers having low perception were old aged and educated upto middle school. They can be considered as

laggards as in their old age these farmers become less enthusiastic to the outside world and develops a negative way of taking facts. It was quite interesting that farmers who had low perception towards homestead agroforestry, had an access to the mass media sources to medium extent and had medium level of cosmopoliteness. The main reason could be that since Kerala is a 100 % literate state almost all the farm families subscribe newspaper and majority of them possess radio, T.V. etc. Mostly farmers try to keep in contact with individuals outside their social system. This nature facilitates interpersonal communication with people outside their village hence leading to better cosmopoliteness level. Low participation in extension activities may be either due to lack of interest, less innovativeness etc. or due to the poor quality of programmes conducted by extension agencies. Scientific orientation and management orientation which are two important aspects in homestead agroforestry, were found to be low among farmers having low perception towards it and it was also found that their accessibility to various credit organizations was alos low. The reason could be their old age and this might have developed negative trend towards life. Hence these type of farmers normally hesitate to try to acquire information regarding new innovations and the methods to adopt them. They tend to be suspicious of innovations, innovators and extension agents. A fast moving world is shocking to them and they find it difficult to adjust with it. Since they have low profit motive, it is natural that their credit orientation will be low.

5.4.2 Characters of farmers having medium perception

From Table 5, it can be concluded that the farmers having medium perception can be grouped as early majority, since they participated in various extension activities and tried to keep in contact with extension agents which must have enabled them to get involved in different learning experiences that generates general awareness towards facts. The are neither very early nor very late to adopt an innovation. Moreover due to repeated exposure to various mass media channels, these farmers are exposed to new innovations and are motivated to have better perception. Hence, they might have developed favourable attitude towards various innovations and try to give more emphasis on cost benefit ratio by making optimum utilization of resources. He may also try to obtain credits from different agencies for adoption of improved technologies in his farm so as to harvests better returns. As given by Rogers and Shoemaker, these farmers these farmers are more likely to be literate, have higher social status greater degree of social mobility, larger size of production unit, commercial economic orientation and have more favourable attitude towards credit. Earlier adopters are no different from late adopters or laggards in age.

5.4.3 Characters of farmers having high perception

From Table 6 it can concluded that farmers were mostly from middle age group and were highly educated. These farmers can be considered as

innovators due to their venturesome nature as they are more responsive to latest technologies and try to acquire more information regarding their cropping systems. Give more emphasis to cost benefit ratio by the optimum utilization of resources leading to higher cropping intensity. They are cosmopolite and their sphere of influence and activity may go beyond the community boundary. Competitive spirit and their desire to get more yield makes their strive, hard to get maximum profit. Mostly these farmers will be risk oriented also. Main reasons for better scientific orientation, management orientation etc. might be due to their high education level, high annual income, cosmopoliteness, high mass media contact, high extension and social participation and high extension contact. As these factors widens the vision of individuals and orients them to the outside world providing new opportunities of life. Hence, these farmers develop higher perception towards HAF.

5.5 Overall attitude of farmers towards homestead agroforestry

From Table 7 can be inferred that even though 42 per cent had less favourable attitude, majority of them had more favourable to favourable attitude towards HAF. This reveals that even with small per capita holding farmers were able to make optimum utilization of available land by growing a variety of annual and perennial crops intermingled with each other. Usually they also include a small unit of animal husbandry and poultry which provides subsidiary income to the household . Thus farmers are able to make better

utilization of available resources which leads to increase in profit and results in development of favourable attitude.

5.6 Classification of attitude of homestead agroforestry farmers based on their personal and socio-psychological variables

5.6.1 Attitude and age of homestead agroforesty farmers

Data from Table 8a revels that there is difference between the different age group of farmers and their attitude level. About half of the farmers had more favourable to favourable attitude while the rest had less favourable attitude, among the 'young age category' whereas among 'middle age category', majority had more favourable attitude and others had less favourable to favourable attitude. In case of 'old age category' majority had favourable to more favourable attitude while rest had less favourable attitude.

Main reason is that young generation is more interested in white collar jobs, whereas the middle age farmers are more directed to profitable farming, but in case of old age farmers, nearly half had less favourable attitude because they might have become less enthusiastic and feel that whatever they had gained so far is enough.

The findings of the study are in confirmity with the past study of Nagpal and Yadav (1991) and in contrast with that of Digraskar and Wangikar (1992), Nimbhal (1995).

5.6.2 Attitude and education

It could be inferred from Table 8b that the attitude level of the farmers belonging to different educational categories is different. Majority of farmers from 'high' and ''medium category' had more favourable to favourable attitude whereas majority of farmers in the 'low category' had less favorable to favourable attitude.

Possible reason must be that education widens the vision of individuals and orients them to outside world providing new opportunities of life. As a result of all these, perception increases and develops a favorable attitude.

Findings are in accordance with the finding of Dixit (1988), Rafi (1993), Nimbal (1995) etc.

5.6.3 Attitude and land holding

Cursory look at Table 8c reveals that there is difference in attitude level among the marginal, small and large farmers. Majority of the 'marginal farmers' had less favourable while majority of 'small farmers' had favourable attitude whereas in case of 'big farmers' greater than one third had more favourable attitude. The reason is that farmers who possess large holdings are economically sound and are better positioned to incorporate different species in the homestead. In light of the above observation it can be stated that only those with adequate size of holding are having favorable attitude towards homestead farming.

The findings of the study are in consistent with the results reported by Dixit (1988), Naik (1994) and Nimbal (1995).

5.6.4 Attitude and annual income

A close look at Table 8d reveals that the differences in the attitude level of different income group of farmers is significant i.e., majority of farmers in 'high' and 'medium category' had more favourable to favourable attitude whereas majority of 'low income category'had less favourable attitude. Farmers with higher annual income can afford to different media's like TV. Newspaper etc. besides enjoying a good social status in the village, which leads to the development of favorable attitude.

The findings are in consistent with the results reported by Naik (1994), Nimbal (1995).

5.6.5 Attitude and social participation

It is quite obvious from Table 8e that attitude varies with the extent of participation. Majority of farmers from 'high' and 'medium category' had more favourable to favourable attitude whereas farmers from 'low social participation category' exhibited less favourable attitude. The possible reason is that farmers with more participation in various social and developmental organizations might have created general awareness which leads to the development of favorable attitude through social interaction.

The findings of the study are in contrast to the findings of Dixit (1988).

5.6.6 Atitude and extension contact

An examination of Table 8f reveals that extension contact is directly proportional to attitude i.e., with increase in extension contact an increase in attitude was observed. High extension contact must have enabled the farmers to participate in several extension activities which provide better farming opportunities. According to Rogers (1962) interpersonal communication is more important in changing the attitude of the individual.

The findings are on par with the findings of Dixit (1988) and Swamy (1988).

5.6.7 Attitude and mass media

Data from 8g reveals that the difference in attitude level of different mass media contact category was significant, i.e., farmers who had 'high' to 'medium mass media contact' had more favourable to favourable attitude and farmers with 'low mass media contact' had less favourable attitude towards homestead agroforestry.

The print and electronic media might have stimulated the farmers to develop favorable attitude toward homestead agroforestry. Moreover since Kerala is a 100 per cent literate state majority of the farmers subscribe newspaper and use to go through it to gather enormous amount of information.

The findings are in confirmity with the findings of Swamy (198), Nimbal (1995), and Surekha (1999).

5.6.8 Atitude and cosmopoliteness

A glance at Table 8h reveals that majority of the farmers from 'high' and 'medium cosmopolite group' had more favourable to favourable attitude and in 'low category', majority had less favourable attitude.

The farmers with high cosmopolite nature will have high contact with individuals outside their social system, which enhances the interpersonal communication with people outside. This way, they are likely to get better cues regarding the mode of their farming which leads to more favourable attitude.

Findings are in consonance with that of Dixit (1988), Swamy (1988) and Surekha (1997).

5.6.9 Attitude and extension participation

Table 8i reveals that there is significant difference in attitude level with respect to extension participation. It could be inferred that with increase in extension participation there is simultaneous increase in attitude also. Possible reasons for this trend may be due to the large number of extension activities conducted as a part of present peoples' plan in Kerala. As a part of this plan, improved breeds of cow, hen and high yielding variety seeds are given to

farmers. The above factor must have lead to the development of positive attitude among farmers.

Findings of the study are in contrast with the findings of Dixit (1988).

5.6.10 Attitude and scientific orientation

Table 8j reveals that attitude differed significantly with scientific orientation i.e., farmers with 'high' and 'medium scientific orientation' had more favourable to favourable attitude and those with 'low scientific orientation' had less favourable attitude. Plausible reason might be that farmers with more scientific orientation could be more responsive to latest technologies, acquire more information regarding their cropping systems and employ scientific methods. Findings are in consistent with the findings of Sinha (1988), Hareesha (1994) and Patil (1994).

5.6.11 Attitude and credit orientation

A critical analysis of Table 8h reveals that among 'high credit orientation category', majority had more favourable attitude. Majority of 'medium and low categories' had favourable attitude and less favourable attitude respectively. This credit orientation behaviour of the farmer makes him to utilize credit even for adoption of cost centered technologies in their fields.

Findings of the study are in accordance with that of Sinha (1988), Patil (1994), Shivasharanappa (1995).

5.6.12 Attitude and management orientation

It could be inferred from Table 81 that there is significant difference in attitude level between farmers belonging to different management orientation categories. Majority of farmers with 'high' to 'medium management orientation category' had more favourable to favourable attitude towards homestead farming while ones with 'low management orientation' had less favourable attitude. Reasons might be that the farmers with high management orientation give more emphasis on cost-benefit ratio and makes maximum utilization of resources which leads to higher cropping intensity. Besides these, farmers' due to thier vast experience in farming are efficient in planning, production and marketing of farm produce. Competitive spirit and their desire to get more yields makes them strive hard to get maximum profit, which culminate in better management.

The findings of the study are in agreement with that of Sinha (1988), Patel (1994) and Shivasharanappa (1995).

5.7 Characters of farmers having less favourable, favourable and more favourable attitude towards homestead agroforestry system in Kerala

5.7.1 Characters of farmers having less favourable attitude

From Table 9, it can be concluded that farmers having less favourable attitude towards were old aged and were mostly educated upto middle school. Even though these farmers were educated, their level of participation in various

social organisations like grama panchayat, cooperative societies was very less. This may be because of the impact of age, as a person in old age always tries to retire from his duty and prefers rest. These farmers can be grouped as laggards as they neither give importance to new innovations nor try to adopt them in their farms and usually these farmers try to satisfy themselves with whatever they have, thinking that old traditional methods are far better than new innovations. By the time this group finally adopt an innovation it may already have been superceded by a more recent idea which innovators are already using. Other characteristics features of laggards are low income, marginal holdings and low mass media contact, but in case of homestead agroforestry it was observed that farmers having less favourable attitude had medium level of mass media contact and cosmopoliteness. The reason might be attributed that since these farmers are educated, they subscribe newspapers and magazines moreover majority of them possess radio also. Farmers do try to mingle with people outside the society to satisfy their needs.

5.7.2 Characters of farmers having favourable attitude

From Table 10, it can be concluded that farmers having favourable attitude can be grouped as early majority as they try to keep in contact with extension agents, mostly participate in various extension activities and get involved in social organisations which exposes these farmers to different learning situations thus widening their vision towards the world. They have

large sized holdings compared to farmers with less favourable attitude. They have more opinion leadership and potential adopters look to them for advice and information regarding the innovations. Hence, these farmers might have developed scientific attitude towards various innovations and try to give more emphasis on cost benefit ratio by making optimum utilization of the resources. Farmers may even try to obtain credit from different agencies and do have favourable attitude towards credit.

5.7.3 Characters of farmers having more favourable attitude

From Table 11, it can concluded that farmers were mostly from middle age group and were highly educated. These farmers can be considered as innovators due to their venturesome nature as they are more responsive to latest technologies and try to acquire more information regarding their cropping systems. They give more emphasis to cost benefit ratio by the optimum utilization of resources leading to higher cropping intensity. They are cosmopolite and their sphere of influence and activity may go beyond the community boundaries. They are mentally alert, have good contact with cosmopolite sources of information and actively try to seek new ideas. Competitive spirit and their desire to get more yield makes their strive, hard to get maximum profit. Mostly these farmers will be risk oriented also. Main reasons for better scientific orientation, management orientation etc. might be due to their high education level, high annual income, cosmopoliteness, high

mass media contact, high extension and social participation and high extension contact. As these factors widens the vision of individuals and orients them to the outside world providing new opportunities of life. Hence, these farmers develop more favourable attitude towards HAF.

5.8 Relationship between personal and socio-psychological characteristics of homestead agroforestry farmers with perception

5.8.1 Age

Age was found negatively and significantly related with the perception of the homestead farmers. That is, negative trend was seen in the relationship between age and perception. This means as age increases perception decreases. As ages increases their perception decrease due to decrease in recalling ability more over they become less enthusiastic and feel that whatever they gained so far is enough,. This attitude towards life will result in a negative trend in perception.

The findings of the study are in contrast with the results reported by Sudheendra (1986), Nimbalkar (1990), Ratnakar (1991), Patil (1994), Arulraj (1995) and Padmaiah (1995).

5.8.2 Education

The statistical analysis indicated a positive and significant correlation between education and perception. Education helps an individual to gain better

awareness. This may be because the farmers who were educated had an opportunity to get exposed to literature on the subject and they were most receptive to new ideas which must have influence to develop better perception towards homestead agroforestry.

Findings of the study are in confirmity with the findings of Ratnakar 1991), Padmaiah (1995), Padmaiah and Ansari (1997) and in contrast with the findings of Sudheendra (1986), Patil (1995), Arulraj (1995).

5.8.3 Land holding

Land holding had a positive and significant relationship with perception. Plausible reason is that individuals having larger land holdings are usually interested to grow different species, which in turn provides high income. Thus the farmers with larger holdings are better positioned than farmers with small holdings. Higher land holding status operates through the financial strength leading to better perception.

The findings of the study are in consistence with the finding of Patil (1994) and Arulraj (1995) and contradict the results of Patel (1993), Padmaiah (1995).

5.8.4 Annual income

The coefficient of correlation between annual income and perception of respondents was found to have positive significant relationship. Farmers with

higher annual income can afford to incorporate HYV in their farm, moreover can have access to different medias like TV., newspaper etc. besides enjoying a good social status in village. The parent findings appear quite logical and obvious.

The findings of the present study are not in agreement with the findings of Nimbalkar (1990), Nagpal (1991), Patil (1994) and Padmaiah (1995).

5.8.5 Social participation

The results presented in Table 12 depicts positive and highly significant relationship between the degree of social participation and perception. It was quite natural that farmers having membership in social organizations had more chance of getting exposed to different sources of information, which in turn would help them to adopt sustainable farming leading to better perception.

5.8.6 Extension contact

Extension contact was found to be positively and significantly related to perception level of farmers.

Farmers with high extension contact must have resulted in participation in several extension activities involving different learning experience, obviously this must have paved the way for better perception.

The results are in agreement with the results reported by Ratnakar (1991), Patil (1994), Arulraj (1995) and Padmaiah (1995).

5.8.7 Mass media contact

The coefficient of correlation between mass media contact and perception of respondents was found to have positive and significant relationship. Mass media play a significant role in the spread of new ideas. Moreover in Kerala, people value newspaper and other mass media as source of bulk information. Due to repeated exposure to these sources they develop better perception.

Findings of the study are in consistent with the results reported by Nimbalkar (1990) and Patil (1994).

5.8.8 Cosmopoliteness

There is significant relationship between cosmopoliteness and perception level of farmers. The possible reason for this may be that cosmopolite oriented individuals will have greater contact with the larger society and this might have broadened their mental horizon and further would have been motivated to orient towards more profitable enterprises.

The above mentioned findings are not in consistent with the results reported by Viju (1988).

5.8.9 Extension participation

Extension participation was positively and significantly related to the perception level of farmers. The possible reason would be due the fact that

participation in extension activities provide opportunities for them to discuss with scientists, extension officers etc, so that they can exchange ideas regarding their farming practice which leads to better perception.

5.8.10 Scientific orientation

There was significant association between scientific orientation and perception of farmers. Scientific orientation makes individuals to think logically, scientifically and go in search of facts that support their believes. Their inquisitive mind might have made them to have better perception towards homestead farming.

The findings are in agreement with the findings reported by Ingle and Virkhare (1988).

5.8.11 Credit orientation

There was significant relationship between credit orientation and perception. Reason may be that by adopting improved technology, a farmer can get better returns. Thus he will be in a better position to repay the loan.

The findings are in accordance with that of Padmaiah (1995).

5.8.12 Management orientation

Management orientation of the farmers was significantly related to perception of the farmers. As farm activities provide scope to plan for better production and marketing activities, hence leads to better perception.

5.9 Relationship between personal and socio-psychological characteristics of homestead agroforestry with thier attitude

5.9.1 Age:

Age was found negatively and significantly related with the attitude level i.e., with an increase in age there is corresponding decrease in attitude. It is quite natural that as age increases, people will become less enthusiastic and they will feel that whatever they gained so far is enough which results in a negative trend in attitude.

5.9.2 Education

Statistical tests reveals that there is positive and significant relationship between education and perception. Possible reason could be that education facilitates to learn more about things in order to take advantage from them thus increases the attitude of farmers.

Findings are in consistent with the results reported by Naik (1994) and Nimbal (1995).

5.9.3 Land holdings

A cursory look at Table 13 reveals that there was positive and significant relationship between land holding and attitude. It is logical to think that favorable attitude toward the cultivation of any species is highly dependent on the area available for cultivation. Higher land holding status operates through the financial strength leading to the development of favorable attitude.

The findings is in consistent with the results reported by Dixit (1988), Naik (1994), Nimbal (1995), Surekha (1997) and was in contrast to the findings of Meti (1990).

5.9.4 Annual income

Annual income was found to have positive and significant relationship with attitude level. The positive relationship between those two variables does not need much explanation. Further, it is beyond doubt that higher annual income would give a farmer sufficient economic stability and indirectly motivate him to develop favorable attitude towards homestead farming.

The findings are in consistent with the results reported by Naik (1994), Nimbal (1995).

5.9.5 Social participation

Social participation was positively and significantly related to attitude. It was quite natural that farmers having membership in social organizations had more chance of getting exposed to different sources of information which inturn will help to develop favorable attitude towards homestead farming.

The findings of the study are in contrast with the findings of Dixit (1988).

5.9.6 Extension contact

Extension contact had a significant and positive relationship with attitude level of homestead farmers as high extension contact enables farmers to participate in several extension activities which provide better learning opportunities.

The findings are on par with the findings of Dixit (1988) and Swamy (1988).

5.9.7 Mass media contact

Mass media contact was positively and significantly related to attitude. The print and electronic media might have stimulated the farmers to develop favorable attitude towards homestead agro-forestry.

The findings are in confirmity with the findings of Swamy (1988), Nimbal (1995), and Surekha (1997) and in contrast to Chandargi (1986).

5.9.8 Cosmopoliteness

Cosmopoliteness had positive and significant relationship with attitude. Farmers will have high contact with individuals outside their social system which enable them to get better cues regarding the mode of farming leading to development of favorable attitude.

Findings are in consonance with that of Dixit (1988), Swamy (1988) and Surekha (1997).

5.9.9 Extension participation

Extension participation was positively and significantly related to attitude. Plausible reason for this trend may be due to participation in a number of extension activities.

Findings of the study are opposite to the findings of Dixit (1988).

5.9.10 Scientific orientation

Scientific orientation was found to have positive and significant relationship with attitude. Farmers are more responsive to latest technologies, acquire more information regarding their cropping system and employ scientific methods.

Findings are in consistent with the findings of Sinha (1988), Hareesha (1994) and Patil (1994).

5.9.11 Credit orientation

Credit orientation was positively and significantly related to attitude. Respondents with progressive values generally use credit as they have ability to repay the loans.

Findings of the study are in accordance with that of Sinha (1988), Patil (1994).

5.9.12 Management orientation

Management orientation had a positive and significant relationship with attitude. Managerial abilities like planning, production and marketing activities of farmers do help in achieving success in a particular operation. In order to gain profits a farmer has to utilize the resources like land, labour and capital skill fully, most efficiently and judiciously in order to make the farming an efficient enterprise.

Similar findings were reported by Sinha (1988) and Patel (1994).

5.10 Contribution of personal and socio-psychological characteristics on perception and attitude of farmers

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. Perception and attitude level is postulated as a function of the independent variables included in the study. Therefore, these dependent variables are not solely influenced by any one of the independent variables but as a part of complex interaction situation. Based on this approach, the multiple regression and stepwise regression analysis was carried out to know the important variables with their predictive ability in explaining the variation in the dependent variables.

5.10.1 Contribution of personal and socio-psychological variables in explaining the perception of homestead agro-forestry farmers

A clear insight into Table 15 points out the decreasing order of importance of the factors important in explaining the variation in perception level of homestead farmers. Annual income (X_4) was the first important factor in explaining the perception level of farmers followed by land holding (X_3), scientific orientation (X_{10}), extension participation (X_9), management orientation (X_{12}), credit orientation (X_{11}), extension contact (X_6), social participation (X_5), mass media (X_7), cosmopoliteness (X_8), education (X_2) and age (X_1). It is also well supported by R^2 (0.5418) and F value (10.54).

It is very interesting to note that annual income, land holding and scientific orientation occupied top position in explaining the variation in perception level of farmers.

Plausible reason is that the individuals with large land holdings are more responsive to latest technologies so as to acquire information regarding their cropping system and employ scientific methods to evaluate it objectively and adopt the innovation in their farms at a faster rate which inturn provides high income, thus making them economically sound.

5.10.2 Contribution of personal and socio-psychological variables in explaining the attitude level of homestead agroforestry farmers

Perusal of Table 17 reveals the order in which 12 independent variables entered the stepwise regression analysis i.e., income (X_4), land holding (X_3),

social participation (X_5), management orientation (X_{12}), mass media (X_7), extension contact (X_6), extension participation (X_9), credit orientation (X_{11}), cosmopoliteness (X_8), scientific orientation (X_{10}), education (X_2) and age (X_1). It is also well supported by R^2 (0.5620) and F value (11.44).

Income, land holding, social participation and management orientation occupied top positions.

Farmers who possess large holdings are usually economically sound and their participation in various social and developmental organsations must have created general awareness. Hence give more emphasis on cost benefit ratio leading to maximum utilization of resources which leads to high cropping intensity. Competitive spirit and desire to get more yield makes them strive hard to get maximum profit.

5.11 Crop diversity in the homesteads.

From table 18 it is clear that the major crops associated with homestead system are coconut (100per cent), banana (99 per cent), Vegetables (98per cent), Mango (95per cent), Papaya (90per cent), tulasi (85per cent), Pepper (83per cent), Glyricidia (83per cent), Arcanut (79per cent), Jack (76per cent), Tamarind (75per cent) etc.

Coconut (*cocos nucifera*) euglogized as 'Kalpavriksha' the tree of heaven is the most dominant plantation crop prevalent in the homesteads of Kerala. It is popularly known as a benevolent provider of all basic necessities.

In addition to coconut, perennial plants such as arecanut, mango, jack, pepper (trailed on arecanut), tamarind and annuals like banana, solanaceous vegetables, bhindi, amaranthus, tapioca, colocasia, dioscoria, amorphophallus, ginger, turmeric etc. are grown. All these crops are grown mixed in the coconut garden without any specific row arrangement.

The top most canopy is occupied by coconut, the second layer by arecanuts, pepper, jack, tamarind and mango, the third layer is occupied by banana, tapioca and fruit plants and the lower most layer of canopy consists of tuber crops vegetables and guinea grass (Plates3to6). The boundaries are fenced using glyricidia etc.

On a close examination of the homestead garden one could see that the farmer has taken every effort to utilize the space both in the horizontal and vertical dimensions. Thus, these homesteads consists of multitude of crops presenting a multitier canopy configuration which ensures a high level of exploitation of environmental resources. The canopy architecture and pattern of component interaction ensure better energy harvesting and soil exploitation.

In addition to this in many homesteads of Kerala, 'Kavus' or 'Sacred grooves' were found. These constitute an integral part of life, culture and folk lore traditions of Kerala. The myths, legends and faith gave divinity to the trees the abode of gods in the form of Naga, Kali and Lord Sastha. These age old cultural and religious practices supported by religious believes directly or

indirectly promoted conservation and sustainable utilization of these natural eco-systems (Plates 7 & 8).

5.12 Range of crop species in different sizes of land holdings

An examination of Table 19 reveals that the range of crop species is low in case of farmers with less area and the range increases with an increase in area.

It's quite obvious as with an increase in area, the tendency of the homestead farmer to incorporate various species in his farm increases so as to ensure high level of exploitation of environmental resources thus increasing the income.

5.13 Classification of crop diverisity based on land holding

A glance at Table 20 reveals that species diversity differed significantly based on land holding i.e., 100 per cent of large farmers had high to medium species diversity in their farms. In case of small farmers majority had high to medium diversity whereas in case of small farmer majority had low to medium diversity.

This is because with increase in area, farmers' tendency to incorporate various species also increase. Moreover, large farmers will be financially sound and will take greater risk to manage different crop production activities.

The findings is in agreement with the findings of Reshmi (1998).

5.14 Classification of profit level based on crop diversity

A cursory glance at Table 21 reveals that profitability varied according to species diversity ; i.e., majority of the farmers with maximum diversity had high profit whereas farmers with medium diversity had medium to low profit and farmers with low diversity had low to medium profit.

The reason is that farmers with high species diversity tries to incorporate various profit yielding crops in their farms like coconut, arecanut, cashew, pepper, clove, nutmeg, ginger, turmeric, teak, anjily etc. which on one hand increases the species diversity and on other hand increases the profit considerably.

5.15 Classification of profit level based on land holding

It can be concluded from Table 22 that majority of large farmers had high profit. Small farmers had medium and marginal had low profit.

It is quite logical to think that farmers with large holdings will take more efforts and risk to manage different crop species. Timely management of the species ensures high yield which leads to high profit. Another reason may be that with increase in area there is corresponding increase in the number species planted which also results in high profit.

The findings are in consistent with the results reported by Reshmi (1998).

5.16 Classification of profit based on live stock possession

It can be concluded from Table 23 that livestock possession had a significant effect on profitability of the farmer. Majority of the farmers with high livestock possession had high to medium profit whereas in the case of medium category farmers had medium to high profit and low category farmers had medium to low profit.

The probable reason is that mostly farmers with high livestock possession will have improved breeds like Jersey, Holstein-friesian, Brown swiss etc. which gives better yield as compared to local breeds. Other than that most of the farmers in this category will be having poultry, goat, buffaloe etc. Some of them also practice fish farming, apiculture etc. So all these paves the way for high profit when compared with the farmers of other category.

5.17 Relationship between land holding, crops and livestock with gross returns

Table 24 reveals that variables land holding, crops and livestock were positively and significantly related with gross returns.

It is logical to think that farmers with greater land holding, high species diversity and livestock will always try to get maximum yield from their resources by taking greater risk to manage different crop production activities scientifically. Thus, this leads to high profit.

Findings are in consistent with the findings of Reshmi (1998).

5.18 Determinants of gross returns in homestead agroforestry

A clear insight into Table 25 reveals that about 89 per cent of variation in gross returns was due to land holding, crops and livestock. Moreover, land holding had significant contribution towards gross returns.

It is a fact that returns increases with an increase of land holding, crops and livestock.

5.19 Relationship between different crop groups with gross returns

Table 26 reveals that all groups i.e., plantation, fruits, vegetables, tuber, pulses, spices, medicinal plants, fodder and tree sp. are positively and significantly correlated with gross returns.

It's quite obvious that the returns especially from coconut, arecanut, banana, spices, teak, anjily etc. do contribute significantly to the gross returns.

5.20 Contribution of crops on gross returns

Regression analysis from Table 27 reveals that 55 per cent of variation in gross returns are due to different crop groups like plantation, fruits, vegetables spices etc.

Further, it can be seen that among all crop groups, plantation contributed significantly to the gross returns followed by spices and fruits.

It is logical to think that coconut, arecanut, cashew etc. contributing the majority of crops in the homestead will definitely play a significant role in

contribution to gross returns. Pepper, clove etc are the most common and most expensive spice's found in the homestead of Kerala and thus they do have direct effect on gross returns.

5.21 Marketing channels adopted by farmers

From Table 28 it can be concluded that majority of the farmers marketed their produce directly whereas some had sort the help of middlemen. The reason may be attributed to their high cosmopolite nature because of which these farmers have better contacts outside their respective villages. Moreover most of them are highly educated. So it is easy for them to analyse the pros and cons of different methods and act accordingly. Some of the farmers resorted to co-operative societies for selling their dairy products so as to get reasonable price.

5.22 Constraints faced by the farmers in practicing Homesteadagro-forestry.

The respondents were asked to express the constraints experienced while adopting homestead farming and are presented in Table 29. The table reveals several problems like non-availability of planting materials, stringent government laws on marketing of homestead produce, deep rooting habit of certain trees, uncertainty of produce, smaller size of land holding, long gestation periods of some trees, scarcity of water etc. The reasons to express all such problems might be mainly due to farmers' past experience and realisation

while adopting the agroforestry practices. Also these problems are quite common.

Constraints expressed are many. Each of one may be important in different perspective. These problems warrant due attention to be paid to individual constraints, in order to create a constraint free atmosphere which could favour large scale adoption of home garden farming by respondents. Hence, adequate attention for extension agency is required to feed back such problems to research stations and obtain solutions.

The above result gets support from the studies conducted by Krishna moorthy (1990), Umale *et al.* (1991), Siakh *et al.* (1993).

SUMMARY

VI. SUMMARY

This study is based on expost-facto research of 3 districts representing different regions in Kerala. The differences in agro climatic region, age of settlement and population density determine the different cropping patterns.

Within the homegarden system, different sub systems could be identified. Apart from different crops as sub systems, a livestock sub system is common in Kerala. Among the crop sub systems, rice cultivation is carried out outside the homestead. Of these sub systems in homesteads seasonal and annual crops occupy the lowest strata of the canopy. Perennial are grown as mixtures of several perennials along with other crop sub systems. The tree crop sub system consists of planted trees of useful species and those that come up naturally. Miscellaneous crops generally occupy the boundary of the homegarden. The Kerala Agricultural University, Farming Systems Research Station, Sadanandapuram have taken up several development programmes in order to identify homestead production. The impact of all these developmental work on perception and attitude of farmers is not well established.

Therefore the present study was conducted with the following objectives:-

1. To study the personal and socio-psychological characteristics of homestead agroforestry farmers.
2. To study farmers' perception and attitude towards homestead agroforestry.

3. To understand the relationship between perception and attitude with their personal and socio-psychological characters.
4. To measure the extent of contribution of personal, socio-psychological characteristics on perception and attitude towards homestead agroforestry.
5. To document the crop diversity in homestead gardens and its impact on profitability.
6. To assess the constraints faced by the homestead agroforestry farmers .

Study was conducted in three districts of Kerala i.e., Kannur representing northern part. Thrissur and Kollam representing central and southern part respectively. From the three districts, 3 taluks were selected randomly and further from each taluk, three panchayats were selected respectively.

From each of the selected panchayat a list of homestead farmers were prepared with the help of concerned agricultural officer, then further respondents were selected randomly. Thus, the total sample for the study constituted of 120 respondents.

There were two dependent variables i.e., perception and attitude and 12 independent variables. The data was collected by personal interview method with the help of pre-tested structured schedule. The data was further tabulated and subjected to simple per centage analysis, mean, standard deviation, chi-square test, simple correlation and stepwise regression analysis.

Findings

The important findings of the study are :-

1. Majority of the farmers belonged to old age group (i.e., 5 years and above). More than 75 per cent of farmers had medium to high level education. 85 per cent of the farmers belonged to small and marginal land holding category. 65 per cent of the farmers had high to medium annual income. 21 per cent of farmers had high social participation whereas 34 per cent had medium participation. Nearly 54 per cent of farmers had medium extension contact. 37 per cent of farmers had high mass media contact. Medium level of cosmopoliteness was expressed by 42 per cent farmers. More than 50 per cent of farmers had medium to high extension participation. 32 per cent had high and 40 per cent medium scientific orientation. 35 per cent farmers had high credit orientation and 44 per cent of farmers had high management orientation.
2. Thirty two per cent of the homestead farmers had high perception followed by 37 per cent and 31 per cent of medium and low perception towards homestead agroforestry. In overall majority of farmers (63%) had high to medium perception towards homestead agroforestry. Among the farmers coming under young age group, highly educated and those with large holdings majority (greater than 80 per cent) had high perception. Majority (greater than 75 per cent) of farmers coming under the high category of annual income, social participation, extension contact, mass media contact,

cosmopoliteness extension participation, scientific orientation credit orientation and management orientation had high perception.

3. Annual income, social participation, extension contact, extension participation, scientific orientation, credit orientation, and management orientation were low, medium and high respectively for farmers having low perception, medium perception and high perception. Those who were having low and medium perception were mostly marginal and small farmers respectively with medium level of cosmopoliteness and mass media contact. They were mostly educated upto middle school, whereas farmers with high perception had high mass media contact, high cosmopoliteness and were highly educated. This group consisted of small and big farmers.
4. Among the farmers, 42 per cent had low attitude whereas the rest 58 per cent had medium to high attitude. Nearly one third of the farmers under the high category of the independent variables had high to medium attitude whereas in case of low category more than 50 per cent had low attitude.
5. Annual income, social participation, extension contact, extension participation, scientific orientation, credit orientation, and management orientation were low, medium and high respectively for farmers having less favourable attitude, favourable attitude and more favourable attitude . Those who were having less favourable attitude and favourable attitude were mostly marginal and small farmers respectively with medium level of

cosmopoliteness and mass media contact. They were mostly educated upto middle school, whereas farmers with more favourable attitude had high mass media contact, high cosmopoliteness and were highly educated. This group consisted of small and big farmers.

6. Characteristics like education, land holding, annual income, social participation, extension contact, mass media contact, cosmopoliteness, extension participation, scientific orientation, credit orientation and management orientation had positive and significant relationship with perception level of farmers whereas age exhibited negative and significant correlation.
7. Characteristics like education, land holding, annual income, social participation, extension contact, mass media contact, cosmopoliteness, extension participation, scientific orientation, credit orientation and management orientation had positive and significant relationship with attitude level of farmers while age was negatively and significantly related.
8. With respect to perception of farmers, the characteristics that contributed significantly were annual income, land holdings, scientific orientation, extension participation, management orientation, credit orientation, extension contact, social participation, mass media, cosmopoliteness, education and age in the decreasing order.
9. Twelve characteristics that contributed significantly towards attitude level of farmers in the decreasing order of their effect are income, land holdings,

social participation, management orientation, mass media, extension contact, extension participation, credit orientation, cosmopoliteness, scientific orientation, education and age.

10. Among the crop preference in homestead the most preferred one was coconut (100 per cent) followed by banana (99 per cent), vegetables (98 per cent), mango (95 per cent), papaya (90 per cent), tulasi (85 per cent), pepper (83 per cent), glyricidia (83 per cent), arecanut (79 per cent), jack (76 per cent), tamarind (75 per cent) etc.
11. Range of the crops increased with increase in area i.e. in less than 2.5 acres 17 to 43 species were there whereas in greater than 5 acres more than 35-51species range was observed.
12. 100 per cent of large farmers had high to medium species diversity whereas small farmers had high to medium and marginal farmers exhibited low to medium diversity.
13. Nearly 95 per cent of the farmers with high diversity had high profit whereas 70 per cent of farmers with low diversity had low profit.
14. 92 per cent of the large farmers had high profit 64 per cent of marginal farmers had low profit and 69 per cent of small farmers had medium profit.
15. Nearly 85 per cent of farmers with high livestock possession had high to medium profit, 53 per cent of farmers with medium livestock possession had medium profit and majority of farmers in the low category also had medium profit.

16. Land holding, livestock and crops exhibited positive and significant relationship with gross returns / per cost.
17. Nearly 89 per cent of variation in gross returns was due to land holding, crops and livestock. Of which land holding was the most significant factor.
18. Different crop groups like plantation, fruits, vegetables, spice, medicinal plants, fodder and forest species exhibited positive and significant correlation with gross returns.
19. Nearly 55 per cent of variation in gross returns was due to plantation, fruits, vegetables, tuber, pulses, species, medicinal plants, fodder and forest sp. Of these plantation followed by spices and vegetables contributed significantly towards gross returns.
20. Majority (65 per cent) of farmers marketted the produce directly whereas 24 per cent through middlemen and rest 10 per cent marketted through co-operative societies.
21. Unavailability of planting materials, stringent laws regarding marketing of homestead produce, deep rooting habit of certain trees, uncertainity about produce from trees, smaller size of land holding, long gestation periods. unavailability of water were the major constraints faced by the homestead agroforestry farmers.

Implications and suggestions of findings of the study for field extension work

The findings of the study have following implications for research work:

1. Majority of the farmers had medium level of perception and low level of attitude towards homestead agroforestry. So extension efforts can be directed for the development of more favourable perception and attitude.
2. Variation in perception and attitude among high category and low category of farmers calls for the intensification of education efforts by the field extension agencies, Krishi Bhavans, Kerala Agricultural University etc.
3. It is required to develop a proper package of practice for homestead in Kerala so as to ensure high level of exploitation of environmental resources. Other facilities like irrigation, regular supply of quality planting materials etc. are very much necessary for getting better returns from homesteads. Hence, the State Government., Department of Agriculture has to make efforts to provide these facilities.
4. There is need to provide credit by different co-operatives and commercial banks especially to the farmers belonging to the low categories like marginal farmers etc. to increase their production efficiency.
5. The independent variables which have shown positive and significant relationship with perception and attitude could be advantageously exploited by the concerned extension agencies in order to educate and

motivate large number of farmers for large scale intensification of homestead agroforestry.

Suggestions for future research

Years of experience suggest that the Kerala home gardens are economically viable, ecologically sound and biologically sustainable. Yet scientific research on this agroforestry system appears to be rare, perhaps due to its complexity or to an inadequate appreciation of its importance and potential. There is need for comprehensive research studies in other areas of the state since the study was conducted only in 3 districts of Kerala (i.e., Kannur, Thrissur and Kollam) with respect to perception and attitude level of homestead farmers. Thus, this will help to make valid generalizations regarding the perception and attitude of farmers towards homestead agroforestry which could be of immense significance in making future extension programmes more useful in meeting the needs of farmers.

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* Originals not seen

APPENDICES

DEPARTMENT OF AGRICULTURE EXTENSION
UAS, GKVK, BANGALORE – 560 065

Researcher : **Nisha Aravind**

Chairman of Advisory Committee : **Dr. N. R. Gangadharappa**

Title : **Agroforestry system in Kerala – Farmers' perception and attitude**

PART I

General Information

Name of the respondent :

Panchayat :

Taluk :

Personal information :

Age of the respondent :

Education :

Sl. No.		
1.	Illiterate	
2.	Primary school	
3.	Middle school	
4.	High school	
5.	College	
6.	Graduate and above	

3. Land holding :

What is the area of land you posses

Land	Rainfed	Irrigated	Homestead	Others
Owned				
Heared in				
Heared out				

4. Annual income

Income from

a) Agriculture species :

b) Horticulture species :

c) Tree / forest species :

d) Livestock :

Total homestead income :

5. Cost incurred :

6. Net profit :

7. Social participation :

	Institutions	Member / Office bearer	Participation	
			Regular	Occasional
a)	Grama panchayat			
b)	Rural clubs			
c)	Planning committees			
d)	Co-operative society			
e)	Others			

8. **Extension contact**

Extension agents	**Frequency of contact**			
	Regular	**Occasional**	**Awareness**	**Never**
1. Agri. Assistants 2. Agri. Officer 3. Subject matter specialist 4. ADA 5. Univ. Scientists 6. Others				

9. **Mass media contact**

a) Do you possess radio /TV : Yes / No

If yes

Radio	**Regular**	**Occasional**	**Never**
Agri related			
News			
Others			
T.V	**Regular**	**Occasional**	**Never**
Agri related			
News			
Others			

b) Do you read any newspaper or magazine : Yes / No

If yes

Name of the newspaper / Magazine	Reading behaviour		
	Regular	Occasional	Never

10. **Cosmopoliteness**

a) How many times you visit the nearest town

Daily	
Several times in the week	
Once in a week	
Twice in a month	
Once in a month	
Never	

b) What is the purpose of your visit

In relation to	
Agriculture	
Forestry	
Personal	
Entertainment	

c) Are you a member / office bearer outside the village Yes / No

If yes give details

11) **Extension participation**

How often you have participated in the following extension programmes

Sl. No		Regular	Occasional	Awareness	Never
1.	Training				
2.	Demonstrations				
3.	Meetings				
4.	Exhibitions				
5.	Film shows / video programmes				
6.	Any other				

12) **Scientific orientation** - Please indicate your choice among 3 alternative for each of the following statement

Statement	Response		
	Agree	**Undecided**	**Disagree**
a) Different conopies of shoot and root system increase solar energy utilization			
b) It is always desirable to grow a mixed cropping pattern of multiple use species such as fodder, fuel etc. in a homestead			
c) The mixed cropping system in homestead will increase resource use efficiency to the highest extent			
d) Mixed cropping system of the homesteads will make that unit uneconomic			
e) Organic recycling will be more in mixed cropped homesteads			
f) Crop livestock fish component integration will enable to utilise that all dimensional phase in an effective way			
g) Homestead agroforestry system without the use of chemical fertilizer and pesticide cannot be considered as farming.			
h) HAF is sustainable farming as it keeps up the ecosystem balance			

13) **Credit orientation**

Indicate your response

a) Do you think farmer practising homestead agroforestry should borrow money from credit institutions (Yes / No)

b) In your opinion how difficult it is to secure credit for agricultural purposes (very easy / easy / difficult / very difficult).

c) There is nothing wrong in taking credit from institutional sources for increasing farm production (Strongly agree / Agree/ Disagree/ Strongly disagree)

d) Did you use credit in last 2 years for cultivation (Yes / No)

14) **Management orientation** – Give your opinion about the following statements (A – Agree , DA – Disagree)

I. **Planning orientation**

1. Each year one should go for changing species combination	A/ DA
2. Prior decisions about plant species to be cultivated is not needed	A/ DA
3. No need to access the amount of seed, fertilizer and plant protection chemicals needed for raising the crop species	A/DA
4. No need to think ahead of crop involved in raising a crop	A/DA
5. One need not consult an agriculture / forest expert so as to decide crop combinations	A/DA
6. It is possible to increase income by adopting	A/DA

II. **Production orientation**

1. Timely planning of different species ensure good yield	A/ DA
2. Fertilizer recommendation should be according to POP given by Agriculture / Forestry dept.	A/ DA
3. Seed rate should be given as recommended by specialists	A/DA
4. Herbicides should be used for timely weed control	A/DA
5. As much as irrigation water available should be used in case of low water rates	A/DA

III. **Market orientation**

1. Should grow tree species with more market demand	A/ DA
2. Should sell their purchase to nearest market irrespective of price	A/ DA
3. Should purchase inputs from shops where others like neighbours and relative purchase	A/DA
4. Should not go for the help of middlemen for marketing produce	A/ DA

15) **Livestock**

Do you possess any livestock if yes give details

1. Possession of one bullock, one local cow on local buffalo
2. Possession of one improved cow on improved buffalo
3. Possession of one sheep /goat
4. Possession of hen
5. Possession of fish

16) What are different crop species existing under

I. a) Plantation b) Fruits c) Spices d) Medicinal e) Vegetables } Horticulture	
II a) Tubers b) Pulses c) Fodder species } Agriculture	
III a) Tree / forest species	

17) How are you marketing the homestead produce ?

a) Direct

b) Through middlemen

c) By help of co-operative society

18) What are the constraints you come across in homestead agroforestry

1. Non-availability of water
2. Smaller size of land holding
3. Stringent government laws on marketing of homestead produce
4. Non-availability of desired plant species
5. Uncertain about the produce from trees
6. Deep rooting habit of certain trees that affect yield of agricultural crops
7. AF tree species results in depletion of soil nutrients
8. Untimely supply of planting material

PART II

I. ATTITUDE OF THE FARMERS TOWARDS HOMESTEAD AGROFORESTRY

A-agree, UD- Undecided, DA- Disagree

1.	HAF is a boon to farmers	A/ UD/DA
2.	HAF requires low financial input	A/ UD/DA
3.	Absolute gain interms of economic returns from HAF is low	A/ UD/DA
4.	By adopting HAF, allround development of marginal farmers is not possible	A/ UD/DA
5.	HAF does not provide employment to the people	A/ UD/DA
6.	HAF may prove risky to small farmers	A/ UD/DA
7.	Soil and water conservation can be achieved through homestead agroforestry	A/ UD/DA
8.	Tree species suitable to reclaim different soil problems cannot be included in HAF models	A/ UD/DA
9.	Tree species in HAF decreases the fertile land available for cultivation of other agricultural crops	A/ UD/DA
10.	AF species compete with other crop species for nutrients and this reduces yield	A/ UD/DA
11.	AF trees grow quickly when compared to other species in homestead agroforestry	A/ UD/DA
12.	Plant protection measures are not needed for trees species in homestead agroforestry	A/ UD/DA
13.	Farmers are free to choose tree species in their farm level	A/ UD/DA
14.	There is lack of co-ordination between supply of seedlings and advice to the beneficiary of HAF farmers	A/ UD/DA
15.	Seedlings are supplied to the farmers only based on need	A/ UD/DA
16.	Various constraints are faced in incorporating different tree species	A/ UD/DA

II. PERCEPTION OF THE FARMERS TOWARDS HOMESTEAD AGROFORESTRY

1) Ecological attributes

a) Type of soil

Suitability of soil for homestead agroforestry when compared to monoculture farming

Highly suitable	Moderately suitable	No change	Less suitable	Least suitable
5	4	3	2	1

b) Local resource utilization

In homestead agroforestry local resources can be effectively utilized than monoculture farming

High in effective utilization	Moderate	No change	Low	Least
5	4	3	2	1

2) Economic attributes

a) Profitability

Maximum financial returns can be increased in homestead agroforestry as compared to monoculture farming.

Highly suitable	Moderately suitable	No change	Less suitable	Least suitable
5	4	3	2	1

b) Marketability

Products from homestead agroforestry can be marketed without any delay as compared to monoculture

Easily marketable	Marketable	No change	Difficult	Very difficult
5	4	3	2	1

c) Economic efficiency

Maximum output/returns can be obtained for every rupee invested in homestead farming

Highly efficient	Moderately efficient	No change	Less efficient	Least efficient
5	4	3	2	1

d) Regularity of returns

Homestead agroforestry can provide returns on a regular basis

Highly regular	Moderately regular	No change	Less regular	Least regular
5	4	3	2	1

e) Temporal attributes
Extent of free time (in hours) available is more in homestead agroforestry system

Substantial increase------ Increase------No change-------Decrease -------- Substantial decrease
5 4 3 2 1

f) Immediacy of returns
Homestead agroforestry can provide immediate returns

Immediate----------Speedy----------No change----------Slow----------Very slow
5 4 3 2 1

3) Socio-psychological attributes

a) Perceived risk
Degree of risk involved in engaging homestead agroforestry in comparison to monoculture farming

High risk---------- Moderate risk---------- No change-------- Less risk--------- Least risk
5 4 3 2 1

b) Cultural compatibility
Degree to which homestead agroforestry is culturally compatible

Highly compatible---Moderately compatible ---No change---Less compatible ---Least compatible
5 4 3 2 1

c) Security need
Degree to which homestead agroforestry satisfies farmers needs

Highly satisfies---Moderately satisfies ---No change---Less satisfies ---Least satisfies
5 4 3 2 1

d) Status need
Degree to which homestead agroforestry can bring status

High status-------Moderate status ------No change------Less status ------Least status
5 4 3 2 1