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Shanaz Fatima

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

GM Bhat

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

MA Islam

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

Tareq A Rather

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

Megna Rashid

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

Meraj U Din Dar

Division of NRM, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

Corresponding Author

GM Bhat

Division of SAF, Faculty of Forestry, SKUAST-K, Benhama, Jammu and Kashmir, India

Traditional agroforestry systems practiced in leh district of Ladakh union territory-India

Shanaz Fatima, GM Bhat, MA Islam, Tareq A Rather, Megna Rashid and Meraj U Din Dar

Abstract

The present study entitled "Traditional Agroforestry systems practiced in Leh district of Ladakh union territory" was carried out, during 2019- 2020. The study site is located between 34° 9' N and 77°34'E at an altitude ranging from 2900-5900 meters (amsl). Multistage random sampling technique was used for selection of sampled blocks, villages and households in leh district. The first stage was the random sampling of seven blocks namely, Leh, Chuchot, Thiksay, Kharu, Khalti, Nimo, Nyoma. The second stage involved random sampling of eleven villages viz., Phey, Stakna, Nang, Upshi, Hemis, Shara, Nurla, Skinding, Umla, Chilling and Nyoma. A total of 164 households were drawn from sample villages which accounts 25 percent sampling intensity. The study included both qualitative and quantitative methods. Data were collected using both secondary sources and primary field survey. Eight agroforestry systems were found prevalent in the district viz., Agrisilviculture, Silvopastoral, Agri-horti-silviculture, Horti-pastoral, Agri-horticulture, Horti silviculture, Agri-silvopastoral systems and homegardens. Homegardens were practiced by majority of the households (154). In all existing agroforestry systems most prominent tree species were Poplar and willow species (forest tree spp) and apple and apricot (fruit tree spp.). In addition to trees farmers also grow agriculture crops and some forage crops. Most common agriculture crops were wheat, barley and vegetables and the common intercropping fodder crops were lucerne and clovers. Due to harsh climatic conditions farmers cultivated crops only during kharif season and during rabi season only few vegetables crops were grown under controlled conditions.

Keywords: Random sampling, homegarden, cultivated, qualitative, quantitative lucerne

Introduction

An attention is given now days to the advancement of sustainable agricultural systems, while particular attention needs to be paid to sustainable land management and to the need for an analytical and holistic approach to sustainable land use (Leakey, 2001) [8]. The exponential growth in the human population has put immense pressure on Indian agriculture, leading to various challenges and restrictions for food, feed, fodder requirements, depletion of natural resources and climate change (Dhyani *et al.*, 2013) [5]. A management system that is capable of producing food from marginal agricultural land and is also capable of preserving and enhancing the efficiency of environmental production must therefore be invented (Dobriyal, 2014) [6]. Agroforestry is the only choice because it has a huge potential to provide both economically and ecologically viable options for large-scale diversification of agriculture for farmers and rural citizens to supplement fuel, fodder, fruits and fibers on one side and to stabilize the ecosystems (increase tree cover, timber production and other wood products thus minimize the pressure on the forest) on the other hand (Bijalwan, 2013) [3]. Agroforestry is not a recent phenomenon, but it has been practiced on agricultural land for various purposes in India for thousands of years. Agroforestry is an innovative approach that blends century-old experience with new science in a small-scale framework and the notion of thought to produce potentially significant and transformative results (Sharma *et al.*, 2017) [14]. Agroforestry is one of the most sustainable land management systems practiced around the world due to socioeconomic benefits that it brings to the farmers. Farmers livelihood can be improved by practicing agroforestry as they have more access to food, fodder, and fuelwood which is reflected by greater access to livelihood capital (Hanief, *et al.*, 2018) [7].

In Ladakh region, the local populations have their own traditional agro-forestry system which plays an important role in meeting various subsistence needs, particularly during the prolonged winter season in xeric conditions. Sparse natural vegetation is the outcome of vegetation over-

exploitation by grazing and vegetative growth removal to satisfy energy needs (fuel wood). Due to harsh winters and poor vegetation cover, the highly motivating factor responsible for the introduction of agro-forestry activities in the Ladakh region was fuel wood and fodder. In addition, for much of the year, the area being remote remains cut off from the rest of the world, so agroforestry in the vicinity meet the needs of people in terms of food, fodder, and timber and also make the environment more stable. *Poplar*, *Salix*, *Juniper* species and a few fruit trees *viz.*, apricot and apple are the main trees growing in the area. The region's traditional agroforestry system exists in the form of an agri-silviculture system that is a combination of agricultural crops with the *Willow (Salix spp.)* and *Popular (Populus spp.)* species on boundaries.

Methodology

Study area

In the cold arid area of Ladakh (Leh district), the research was conducted. The district lies at an altitude ranging from 2900-5900 meters above mean sea level between the geographical coordinates of 34° 9'N and 77° 34'E. The district's gross geographical area is 45110 sq. Km, of which 29 sq. Km is covered by forests. With an area of 45110 sq. Kms, leh is one of the world's oldest and most elevated inhabited region of world, with 112 inhabited villages and one uninhabited village, which probably makes it the second largest district in the country in terms of area. The district is situated in the eastern portion of the Ladakh region, bordered by the sinking Chinese in the north, Tibet in the east and Lahul Spiti area of Himachal Pradesh in the south, together with the other district of Kargil in the Ladakh region.

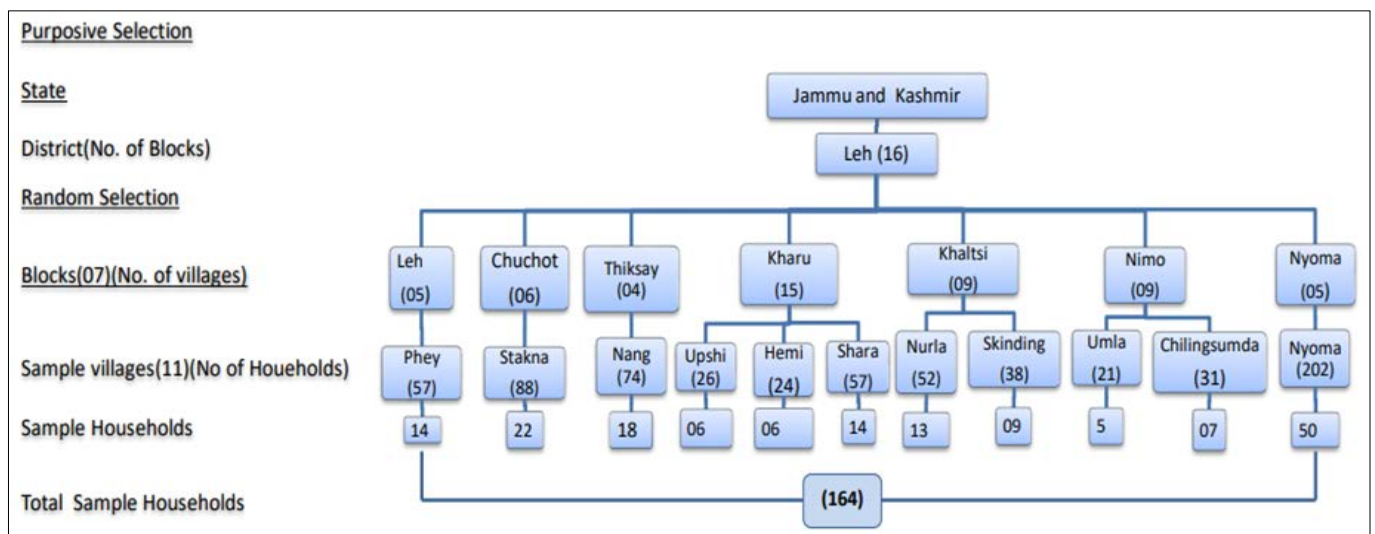


Fig 1: Map of Study area

The northern tip of the Indian Sub-continent is the district of Leh. The whole of the district is mountainous region with three parallel ranges of the Himalayas, the Zaskar, the Ladakh, and the Karakoram ranges. The entire district remains cool throughout the year due to its location and high altitude. The winters are always severe and make the area inaccessible, as road links from Srinagar and Himachal Pradesh remain closed due to the closing of the Zojila and Rohtang passes due to heavy snowfall. In comparison, at some sites, the temperature falls as low as (-30) degrees celsius. The rainfall is scanty and negligible, which makes the district a cold desert. On average, however, 225 days a year remain sunshine in the district. As per the 2011 census, there are 133487 souls in the population of leh district. Leh is one of the areas where the populated parts of the world have the lowest population density. The main occupation engaging the working force is cultivation, agriculture labour, household industry and other works. Agriculture is the district's primary means of livelihood. The district has a reporting area of 45167 hectares, according to revenue department village papers, of which 10542 hectares have been put under cultivation. Horticulture also plays a major role in supplementing farmer's income, which has therefore taken considerable significance in recent years in leh district. Apricot and apple are the major

productions, but other varieties, i.e. Grapes, water melon, are also grown in some areas. The fruit produced is sold in leh town, other places of the world and supplied by cooperative marketing societies to the defense forces stationed in the area.

Sampling technique and sampling

The current research was performed in Leh district of Ladakh. The blocks, villages and households were chosen using a multi-stage random sampling technique (Ray and Mondol, 2004). The first stage was to randomly sample seven blocks in the district, namely Leh, Chuchot, Thiksay, Kharu, Khaltsi, Nimo, Nyoma. The second stage included a simple random sampling of eleven villages, *viz.*, Phey from Leh block, Stakna from Chuchot block, Nang from Thiksay block, Upshi, Hemi, Shara from Kharu block, Nurla, Skinding from Khaltsi block, Umla, Chilling from Nimo block and Nyoma from Nyoma block. A total of 164 households were selected for the field study from the sample villages with a 25 per cent sampling intensity using a basic random sampling technique. Either household heads or eldest members were the respondents interviewed. As outlined below, the description of the sample selection process is shown in the flow chart in Fig. 2.

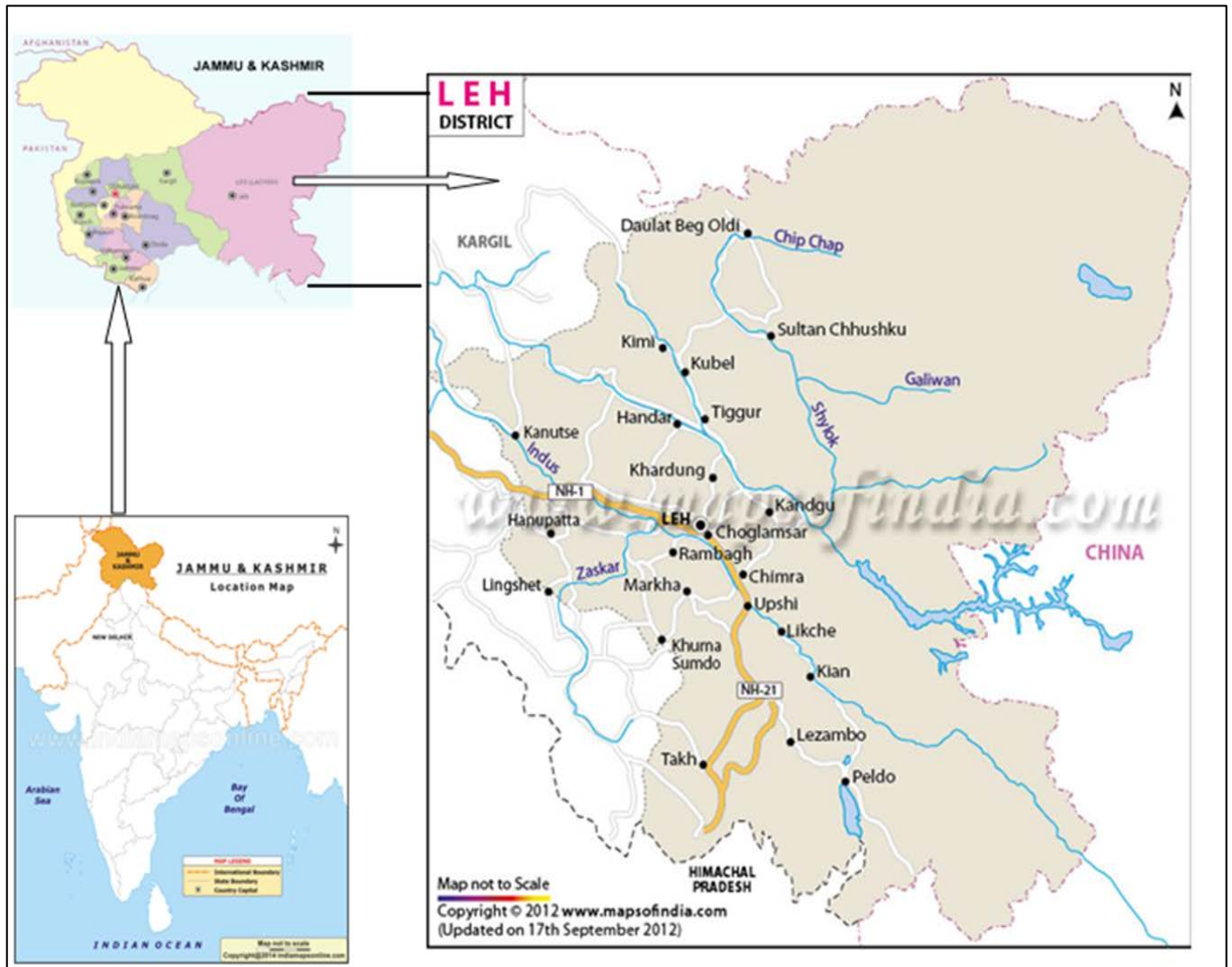


Fig 2: Sampling procedure

Data Collection

In order to achieve the research goals, both qualitative methods were used in the present analysis. Using secondary sources and primary field surveys, data was gathered.

Results and Discussion

The data presented in the table 1 revealed that there are eight Agroforestry systems practiced by the respondent (164) in the study area viz., Agrisilviculture, Silvipastoral, Agri horti silviculture, Hortipastoral, Agrihorticulture, Horti silviculture, Agrosilvopastoral systems and homegardens. Among the systems homegarden was adopted by maximum respondent (154) with 15 hectares land under this system followed by agrisilviculture systems (146) with area 32.65 hectares and only 19 respondent was practised agrihorticulture system with area 3.95 hectares. In all existing agroforestry systems, different kinds of forest tree species were grown by farmers either on boundary or in block or in some cases scattered in a systematic manner. Most prominent among them were *Poplar* and *Willow* species (forest tree species) and the prominent horticulture trees species were apricot, apple and walnut while as the prominent agricultural crops were wheat, barley, buckwheat and vegetables during kharif season and only few vegetables were grown during rabi season under controlled conditions due to harsh climatic conditions. In addition to agricultural crops, fodders were also grown by farmers in

their farmlands in different agroforestry systems which included alfa-alfa, oats, red and white clover. Different livestock viz., Cattle, yak, dzo, sheep and goat were mostly reared by farmers in agrisilviculture, silvipastoral, hortipastoral, and agrosilvopastoral systems and poultry was also a component of homegardens (Table 1). Maximum cropping intensity was found under homegarden (115.3%) followed by agrisilviculture (103.5%) and minimum was found in silvipastoral (98.8%) Table 1.

The perusal of table 2 indicates that different tree species were grown in the study area by farmers and are listed in the table 2 viz., *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, *Populus balsamifera*, *Juniperus polycarpus*, *Juglans regia*, *Elaeagnus angustifolia*, *Prunus armeniaca*, *Malus domestica*. With regard to different growth parameters taken and presented in table 2 indicated that height of different species viz., *Salix* species ranged between 1.5-8.75 m, *Poplar* 9.3-15.6 m, *Juniper* 1.5-2 m, walnut 3.1-6.2 m, *Oleaster* 4.6-7.8 m, apricot 3.1-7.8 m, and apple ranged between 3.7-8.7 m. Among the species maximum height was recorded in *Populus balsamifera* (10.9-15.6 m) and minimum height was recorded in *Juniperus polycarpus* (1.5-2 m). The species were planted by farmers at different spacing in the existing agroforestry systems as in case of *salix* species ranged between 0.3-1.8 m, *Poplar* 0.6-1.40 m, *juniper* 2-3 m, walnut 4.5-6 m, *oleaster* 0.9-1.25 m, apricot 1.25-1.8 m, and

apple ranged between 1.5-2.1m and maximum spacing was recorded in *Juglans regia* (4.5-6 m) and minimum spacing was recorded in *Salix elegans* (0.3-0.6 m). Diameter at breast height (dbh) of salix species ranged between 2.3-79.6 cm, *Poplar* 19.1-66.8 cm, juniper 3.1-3.8 cm, walnut 31.7-40.2 cm, oleaster 3.8-4.7 cm, apricot 12.7-31.8 cm, and apple ranges between 9.5-28.6 cm and maximum dbh was recorded in *Juglans regia* (31.7-40.2 cm), while as minimum dbh was recorded in *Juniperus polycarpus* (3.1-3.8 cm). Age of different tree species was recorded and the maximum age was observed in *Populus nigra* (22-70 yrs.) and minimum age was observed in *Prunus armeniaca* (15-40 yrs.).

Agroforestry systems have been classified according to the components present –trees with crops are referred to as silvoarable or agrisilviculture, trees and pasture as silvopastoral, fruit trees and crops as horti agriculture, fruit trees with pasture as hortipastoral and trees with crops and animals as agro-silvopastoral. A total of eight agroforestry systems, including, homegardens, horti agriculture, boundary plantation, horti-silvipasture, horti-silviculture, horti-silvi-agriculture, silvopastoral and hortipastoral systems were reported from the study area. Among the woody perennials, the highest preference was for fruit yielding tree species. The state of Jammu and Kashmir, especially the valley of Kashmir has a rich diversity of traditional agroforestry models which are in existence since time immemorial (Dar *et al.*, 2018) [15]. Various agroforestry practices identified in

Eight different agroforestry systems were identified as Agrisilviculture (boundary plantation /wind breaks), Silvopastoral, AgriHorti silviculture, Agrihorticulture, Hortipastoral, Horti silviculture, Agrosilvopastoral systems and homegardens. Homegardens were practiced by majority of farmers 93.9%(154) with area under this system is 15 hectares followed by agrisilviculture system 89% (146) with 32.65 hectares followed by Agrosilvopastoral systems 74.3% (122) with area of 23.1 hectares, Silvopastoral 46.9%(77) with area 13.55 hectares, Agri Horti silviculture 29.2% (48) with area 9.15 hectares, Hortipastoral 25.6% (42) with area of 8.3 hectares, Horti silviculture 17%(28) with area of 4.85 hectares and the Agrihorticulture system only by 11.58% (19) with area of 3.95 hectares (Table 1).

Home Gardens

Home gardens were the most common system in both rural and urban areas, which was adopted 93.9 per cent (154) in the study region by maximum farmers (Table 1). Home garden in the Leh district was a subsistence land use system where family labour intensively facilitated and managed interaction and intimate association of various output components (crop-tree-pasture) *in situ* in order not only to fulfill food production but also to produce additional revenue through the selling of farm surplus. This interaction and intimate association made it ever evolving and added significance to the structure of home gardens. This system was very vibrant with farmers who had land holding of less than 1.0 ha, just in and around their dwellings or away from home. Farmers grow fruits and forest trees with vegetables crops during Rabi and Kharif season. This is the only system in leh where farmers grow vegetables both during rabi and kharif season but in rabi season under controlled conditions (polyhouses) due to the harsh climatic conditions. The commonly found tree species in this system were *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Populus*

nigra, *Populus balsamifera*. The fruit trees include *Prunus armeniaca*, *Malus domestica*. Vegetables include Cabbage, turnip, cauliflower, brinjal, beans, onions, spinach, potato, tomato, carrot, radish, coriander, cucumber, bottle gourd, broccoli, watermelon, lettuce during kharif season while Lettuce, Chinese cabbage, fenugreek, Spinach, coriander, cabbage during rabi season under controlled conditions. The variety of these systems was commonly very highly practiced for home consumption according to the preference and family members were the labor inputs.

Agrisilviculture system (Boundary plantation /wind breaks)

The agri silvicultural system is one of the oldest conventional systems and is the most favoured system in the province. On the one side, farmers tended to have trees in and around their farm fields (as border plantations) to protect agricultural crops (as windbreaks) and to satisfy the need for wood, forage and small timber on the other. This system was practiced by almost majority of the farmers 89%(146) in the study area, and the system cover a land area of 32.65 hectares (Table 1).The boundary plantation is also seen alongside the road and canal/irrigation channels. This system is most frequent in the region with tree species like *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, *Populus balsamifera* and *Elaeagnus angustifolia* in multiple rows around the fields along with barley, wheat and buckwheat as associated crops. Trees are found in and around the field in scattered manner.

Silvopastoral System

Tree production was the main motive of this system, and this system was practiced by about 46.9 per cent (77) farmers and 13.55 hectares of land in the surveyed area under this system. Multipurpose trees were planted as block plantations on a piece of land and some grass species were cultivated between trees (Table 1).The system providing fuelwood, fodder, and small timber to the households. The notable tree species included *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, and *Populus balsamifera*, while as the grass species included Oats, red & white clover and alfa-alfa.

Horti silviculture

The main motive of this system was fruit production and about 17% (28) farmers practiced this system and 4.85 hectares of land is under this system in the surveyed area. Multipurpose trees were raised on all sides of the orchard in single or paired rows along the boundary (Table 1). The trees planted around the orchards provide wind protection to the fruits trees besides providing fuelwood, fodder, and small timber. The notable tree species included *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, and *Populus balsamifera*, while the fruit trees included *Juglans regia*, *Prunus armeniaca*, and *Malus domestica*.

Agri-horti-silviculture System

The system was mainly practiced by farmers who do not have much area to produce the different components separately and about 29.2% (48) farmers practiced this system with area 9.15 hectares of land is under this system in the study area. In this system mostly the forest trees are planted along the

agriculture field and the fruit trees are both along and in between the agriculture fields. The agricultural crops grown were wheat, barley and buckwheat in kharif season only, due to harsh climatic condition no crops were grown in rabi season. Commonly grown forest and fruit trees included *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, *Populus balsamifera*, *Juglans regia*, *Prunus armeniaca*, and *Malus domestica*.

Agri-silvi-pastoral System

This agroforestry practice had all the components of agri-silviculture system along with some forage species. This system was practiced by about 74.3% (122) farmers with an area coverage of 23.1 hectares in a study area. Farmers preferred grasses like Oats, red & white clover, alfa-alfa in addition with some forest and fruits trees included *Salix alba*, *Salix tetrasperma*, *Salix daphnoides*, *Salix elegans*, *Populus nigra*, *Populus balsamifera*, *Juglans regia*, *Prunus armeniaca*, and *Malus domestica*.

Horti pastoral system

This type of agroforestry system occurs in low lying areas only. This system was practiced by about 25.6% (42) farmers with an area coverage of 8.3 hectares in a study area. In this system grass species were grown in between the fruit trees. In general apricot is the most dominating fruit in leh district, but as per my study which was mostly conducted in the eastern part of leh where fruits are grown on a small scale due to some climatic condition, apple dominating most in the hortipastoral system. Commonly found grass and fruit trees included Oats, red & white clover, alfa-alfa, *Juglans regia*, *Prunus armeniaca*, and *Malus domestica* Fruit trees like apple, apricot with grasses like alfaalfa, *Trifolium* spp., oats, etc. form the components of this system.

Agri-horticulture system

The agricultural crops like wheat, barley, buckwheat were cultivated with fruit trees included *Prunus armeniaca*, and *Malus domestica*. About 11.58% (19) farmers with area coverage of 3.95 hectares in the study area adopted this system. The farmers grow agricultural crops along with the fruit trees in the initial years of the orchard establishment later on give up with the growth of fruit trees. This system starts with two components i.e. horticulture & agriculture and ended up with one only.

The results get authenticated by the research done from time to time by different workers. Meraj (2019) ^[9] carried out a study and recorded that in the district of Ganderbal of Jammu & Kashmir, six agroforestry systems viz., Boundary plantation, Homegarden, Horti-agricultural system, Horti-silvi-pasture system, Horti-silviculture system, Horti-silvi-agriculture system were prevalent and mostly adopted by the farmers was Homegarden. A research was carried out by Banyal *et al.*, (2016) ^[16] in the Jammu & Kashmir region of Kashmir and Ladakh. Two physiographic regions/zones are falls under the study area, namely the temperate Kashmir

valley comprising the valley floor and the trans-Himalayan Ladakh comprising the Kargil district under the Zaskar range and the Changthang plateau The total number of agroforestry systems in the valley is 9 on the basis of the latest records, including boundary plantation, agricultural system, Horti silviculture system, Horti-agrisilviculture system, Silvopastoral system, Homestead agroforestry, other systems such as alley cropping, live hedge row, riparian tree buffer, Short Rotation Intensive Culture (SRIC). The commonly prevalent agroforestry systems in Ladakh province Boundary plantation, Agri-silviculture system, Agri-silvipastoral system, Horti-pastoral system, Horti-silviculture system, Horti-agriculture system, Horti-silvipastoral system. Sabeena (2016) ^[17] carried out a study and recorded that four agroforestry systems viz., Boundary plantation, Homegarden, Horti-agricultural system, Horti-silvi-pasture system were prevalent in the Budgam district and the Horti-agricultural system was mostly adopted by the farmers. Bhat *et al.*, (2010) ^[2] recorded that farmers of the border and backward district of Kupwara of Jammu & Kashmir were practiced seven conventional agroforestry systems, namely, agrisilviculture, homegarden, agri Horti silviculture, silvi horticulture, scattered tree species, shifting cultivation and trees on range lands. Different tree species viz., *Poplar* species, *Salix* species, *Ulmus wallichiana*, *Juglans regia*, *Robinia pseudoacacia*, etc were found growing inside crop fields, on the boundaries at high densities under different Agroforestry systems. Agriculture crop were grown in alley with different kinds of fruit trees, viz Apple, Peach, Pear, Apricot., However, peach, pear, apricot, plum were grown at scattered locations in the orchards. Maize was found to be grown through out districts by the farmers. Paddy, however, was limited only to plain portions. The need for fuelwood was satisfied by the surrounding woods. Behera and Sharma (2007) ^[1] recorded that widely practiced agro-forestry systems in our country are: (1) Agri-silviculture (crops + plants), commonly referred to as agricultural forestry (2) Agri-horticulture (crops + fruit trees); (3) Silvi-pasture (trees + pasture + animals); (4) Agri-horti-silviculture (crops + fruit trees + MPTS + pasture); (5) Horti-silvipasture (fruit trees + MPTS+ pasture); (6) Agri-horti-silviculture (crops + fruit trees + MPTS + pasture). Mughal and Khan (2007) ^[11] recorded that in the province of Kashmir there were only nine agroforestry systems: boundary plantation, agricultural system, Horti silviculture system, Horti silvipasture system, Horti agrisilviculture system, Silvopastoral system, Hortipastoral system, Homestead agroforestry, and other systems such as alley cultivation, live hedge track, riparian tree buffer, intense culture for quick rotation. Seven viz., Boundary plantations/Wind breaks, Agrisilviculture system, Agrosilvopastoral, Hortipastoral, Horti silviculture, Horticulture, Horti silvopastoral were the generally prevailing agroforestry systems in the case of Ladakh province. The agricultural system is the most favored system in the province, although fruit-based systems are the most preferred in the province.

Table 1: Traditional agro-forestry systems practised in Leh

| S. no. | System | Household adopting (%) | Area in hectares | Tree crop combination | | | | | |
|--------|--|------------------------|------------------|--|--|--|--|--------------------------|--------------------------------------|
| | | | | Trees | | Crop | | Livestock | Grass |
| | | | | Forest trees | Fruit trees | Kharif | Rabi | | |
| 1 | Agrisilviculture (Boundary plantation) | 146 (89.02) | 32.65 | <i>Poplar</i> spp., <i>willow</i> spp., | - | Barley, wheat, buckwheat | - | Cattle, sheep, goat, dzo | |
| 2 | Silvopastoral | 77 (46.9) | 13.55 | <i>Poplar</i> spp., <i>willow</i> spp., | - | - | - | Cattle, sheep, goat, dzo | Oats, red & white clover, alfa-alfa, |
| 3 | Hortisilvicultural | 28 (17.07) | 4.85 | <i>Poplar</i> spp., <i>willow</i> spp., | <i>Malus</i> spp., <i>Prunus</i> spp., <i>Juglans</i> spp. | - | - | - | - |
| 4 | Agrihorticulture system | 19 (11.5) | 3.95 | - | <i>Malus</i> spp., <i>Prunus</i> spp., <i>Juglans</i> spp. | Barley, wheat, buckwheat, | - | - | - |
| 5 | Agri Horti silviculture | 48 (29.2) | 9.15 | <i>Poplar</i> spp., <i>Willow</i> spp., | <i>Malus</i> spp., <i>Prunus</i> spp., <i>Juglans</i> spp. | Barley, wheat, buckwheat | - | - | - |
| 6 | Agrosilvopastoral | 122 (74.3) | 23.1 | <i>Poplar</i> spp., <i>willow</i> spp., | - | Barley, wheat, buckwheat | - | Cattle, sheep, goat, dzo | Oats, red & white clover, alfa-alfa, |
| 7 | Horti pastoral | 42 (25.6) | 8.3 | - | <i>Malus</i> spp., <i>Prunus</i> spp., <i>Juglans</i> spp. | - | - | - | Oats, red & white clover, alfa-alfa, |
| 8 | Home garden | 154 (93.9) | 15 | <i>Poplar</i> spp., <i>willow</i> spp., | <i>Malus</i> spp., <i>Prunus</i> spp., | Cabbage, turnip, cauliflower, brinjal, beans, onions, spinach, potato, tomato, carrot, radish, coriander, cucumber, bottlegourd, broccoli, watermelon. | Lettuce, Chinese cabbage, fenugreek, Spinach, coriander, cabbage | poultry | - |

Figures in the parenthesis represent percentage of the total sample (164)

Table 2: Growth characteristics of tree species

| S. No. | Tree Species | Family | Common Name | Local name | Height range(m) | Spacing range(m) | DBH range(cm) |
|--------|-------------------------------|--------------|----------------|------------|-----------------|------------------|---------------|
| 1 | <i>Salix alba</i> | Salicaceae | White willow | Malchang | 3.1-4.6 | 1.2-1.8 | 28.6-79.6 |
| 2 | <i>Salix tetrasperma</i> | Salicaceae | Indian willow | Selchang | 4.6-7.8 | 0.78-1.25 | 3.9-7.9 |
| 3 | <i>Salix daphnoides</i> | Salicaceae | Violet willow | Shoa | 5.6-8.75 | 0.78-1.25 | 4.7-7.9 |
| 4 | <i>Salix elegans</i> | Salicaceae | Elegant willow | Drokchang | 1.5-3.1 | 0.3-0.6 | 2.3-3.9 |
| 5 | <i>Populus nigra</i> | Salicaceae | Black Poplar | Yulad | 9.3-14 | 0.6-1.25 | 19.1-66.8 |
| 6 | <i>Populus balsamifera</i> | Salicaceae | Balsam Poplar | Byerpa | 10.9-15.6 | 0.6-1.40 | 19.1-57.3 |
| 9 | <i>Juniperus polycarpus</i> | Cupressaceae | Juniper | Lashuk | 1.5-2 | 2-3 | 3.1-3.8 |
| 10 | <i>Juglans regia</i> | Juglandaceae | Walnut | Starga | 3.1-6.2 | 4.5-6 | 31.7-40.2 |
| 11 | <i>Elaeagnus angustifolia</i> | Elaeagnaceae | Oleaster | Sersing | 4.6-7.8 | 0.9-1.25 | 3.8-4.7 |
| 12 | <i>Prunus armeniaca</i> | Rosaceae | Apricot | Chulli | 3.1-7.8 | 1.25-1.8 | 12.7-31.8 |
| 13 | <i>Malus domestica</i> | Rosaceae | Apple | Kushu | 3.7-8.7 | 1.5-2.1 | 9.5-28.6s |

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