Chapter 5

Conclusions

and

Recommendations
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5.1 Conclusions

Developments in the field of agroforestry and the rapidly expanding interest in this field in recent years, witnessed by a myriad of research and development activities all over the world, leaves no doubt that agroforestry as an approach to land development is now accepted by most. Increased concern at the highest International Policy levels about the sustainability of agricultural development is a motivational factor to promote agroforestry in Iran. In the light of the apparent rapid depletion of the natural resource base, agroforestry has come into the limelight. Trees and shrubs, if properly selected and managed, have potential to cope up with disaster and create a congenial environment in addition to conserving soil productivity.

Since the findings of the study pointed out that there is scope for improving the perception level and creating a more favourable attitude of farmers towards agroforestry, development functionaries can intensify their efforts to achieve the increased perception and attitude of farmers. It was found that there was a big gap in complete adoption of all the agroforestry practices. In order to bridge this gap, development agencies should further intensify their extension activities to motivate and adopt various practices either in the traditional system or establish in new areas. Results showed that agroforestry has brought improvement in socio-economic conditions of farmers and ecological conditions of this region by generating employment, increasing family income, enhancing the crop diversity and reducing dependency on natural forests. Therefore, development agencies can use the success story of agroforestry to stimulate other farmers to attain natural resource conservation and socio-economic sustainability.

It can be concluded that given the socio-economic and environmental setting of the area, traditional agroforestry is still a viable and sustainable farming system in the West Zagros Mountains despite the problems associated with it. Traditional agroforestry under favourable conditions can ensure food security, increased water supply, soil fertility enhancement, soil erosion control and minimise total crop failure in case of adverse climatic conditions such as drought.
In addition, research on the most appropriate tree-crop combination capable of solving multi-problems should be initiated. For instance, trees should be fast growing and cater to fuelwood and timber, with minimum competition effect in terms of moisture, light and nutrients to facilitate production of annual crops. The degradation of the forest resources and population pressure are posing great challenges in land intensification and diversification of income sources for the livelihood of small farmers. Greater awareness of households towards economic and environmental benefits of agroforestry can be attributed to the higher rate of education of households and external intervention. The influence of external organisations can increase the access to market, road and transport, and make farmers shift from subsistence to market-based farming. Development of organised marketing mechanism can help these households to cope with the changing agroforestry system and link with outside market outlets. Small households have developed their own preferences towards fodder trees. Extension organisations in their programmes need to give priority to fodder trees preferred by the households based on their own experience and that which fits in their specific local condition. This necessitates participation of households in planning and implementation of agroforestry programmes. Policy makers need to turn their attention towards the needs and knowledge of households, while developing strategies for the development of agroforestry policies for sustainable rural livelihood.

The present study revealed the farming practices of two groups of farmers which were compared (traditional and modern agroforestry systems in Iran). Most significantly, the farmers who used improved methods had great influence on their incomes and livelihood development. These farmers also had larger land holdings and more off-farm income. However, there were also farmers who did not own livestock or possess large farms, but who were efficiently using the existing land area, with mixed cropping systems and available organic manure, and thus obtaining a higher income than their neighbours. There were also farmers with large land holdings and improved cattle who did not cultivate their land efficiently or use farmyard manure, and thus remained with low income.

According to the farmers interviewed, one of the most important reasons for adopting improved cultivation method is the knowledge gained about it. Many farmers lacked information and encouragement to change their traditional cultivation systems. There are gaps in knowledge and often research findings and extension services fail to reach
the majority of the farmers. It can also be speculated that some farmers are more innovative than others in using new methods.

The location was an important factor characterising the farmers who used either improved or traditional cultivation methods. As regards adoption of improved cultivation methods, it seemed that the highland farmers had better opportunities to develop effective farming systems than those in the low land. It was observed that most of the highland farmers used improved farming methods, compared to the lowland farmers. This was most probably due to better road connections, higher off-farm income, larger land holding size and more secure land tenure. Highlands have until recently had more public forest areas available, which explains the larger land holdings there. As an additional factor, highlands, which are more fragile ecologically, have been the focus of various development projects in the area and the information on new income generating activities has reached the highland farmers well. These facts can at least partly explain the considerable difference in income and cultivation practices between highland and lowland farmers.

As discussed above, the present study could not precisely or separately analyse all the factors underlying the observed differences in crop yields and income between the two farmer groups (i.e. those with traditional or improved cultivation methods). The differences may also partly be explained by the qualitative criteria used when forming the two groups (traditional, improved). These may provide a categorisation into well resourced and less resourced farmers. All the information on cultivation practices and their resulting effects was based on reporting by the farmers. As is known, farmers normally do not keep any records on the yields or income. Thus, all the quantitative information can be considered only as an estimate.

However, farmers need professional assistance to find the most suitable combinations in respect of their family needs, the soils, and market and labour limitations. The main task is to select the most suitable tree species for different systems.

5.2 Recommendations and advices to improve agroforestry systems in Iran

- As the forest cover in this part of Iran is sparse with an open crown density and the wood quality of forest species such as *Quercus persica* is not
commercial, the priority in this type of forest cannot be timber production. Moreover, based on the socio-economic characteristics of the local people and their requirements, preserving a virgin forest is not possible. Thus, the plans and management should aim at production of fodder and other non-timber forest products.

- As long as agroforestry systems are developed for household consumption, marketing is not a matter of concern for them. But by expanding the scale of operation, the major challenge for farmers becomes marketing. Meanwhile, the brokers take advantage of the dull market, which discourages farmers from selling. That is why one of the most important socio-economic aspects of agroforestry is to provide an accessible and competitive market for farmers.

- There should be an integrated management to develop a successful agroforestry system. For example in silvipastoral systems, all the included components and other related elements such as livestock, rangeland development and forest conservation should be included. The main objective of this system is foliage production and site rehabilitation simultaneously.

- To establish plantation of *Zizyphus sp.* for reforestation, range sowing and irrigated cropping, seed improvement is foremost.

- Plant *Prosopis sp.* for down rangeland reclamations, because of its easy establishment and palatability of pods but not the foliage and also for the possibility of grass growing in its understorey.

- Ensure a mixed plantation of multipurpose trees and *Amygdalus sp.*, where almond which is a tolerant species can stay alive in case the others dry up.

- Citrus and palm plantation can be established in tropics and dry temperate plain zones.

- Exploring the native species in range and forest management and evaluating their use in agroforestry systems is beneficial. For example, some of the
fruit trees planted in farm houses can be suggested for agroforestry on farm lands.

- For the local people who are transiting from nomadic to sedentary system for self-sufficiency, the homegardens can offer better solutions as various products can meet their household needs and the surplus can be sold.

- Under rainfed farming systems in mountainous and hilly zones where the forest area has been degraded, it is better to promote agroforestry, using nitrogen fixing trees as agriculture alone will not be economically viable and environmentally sustainable.

- While promoting agroforestry for enhancing income, preference should be given to local species and before introducing exotic species, a thorough evaluation should be carried out to find out their adaptability to the local climate and demand for the produce.

- There is good scope to improve the homegarden systems through different combinations of species and their placements. The components can vary according to the household needs, farmland size and quality and climatic conditions.

- Introduction of apiculture has good scope to combine with agroforestry. However, further research is needed to manage bee hives during different seasons. Special introduction of tree species to sustain bee colonies should also be planned.

- A strong extension network should be established to create awareness among farmers to adopt suitable agroforestry systems depending on their needs and opportunities and meet the basic needs such as fuel, fodder, shade, shelter, etc.

- Establishment of fodder trees on degraded rangelands can reduce the grazing pressure on pastures. For this purpose, native or even exotic tree species can be suggested.
• Mushroom cultivation under trees can also be a profitable income generation activity for local people.

• Drought tolerant multipurpose trees such as Acacia sp. and Prosopis sp. which have the potential for nitrogen fixation, are recommended for infertile soil and dry zones.

• Optimum use of native multipurpose trees and shrubs such as Calotropis procera, Leptodaenia pyrotechnia, Zizyphus nummularia and Zizyphus spinachristi may be planted for rangeland reclamation and fodder production by local farmers.

• Restore vegetation on rangelands and pastures to improve the sustainability of livestock husbandry in the area.

• Zizyphus sp. is one of the multipurpose shrubs which yields foliage for livestock and fruits for human consumption. The fruit yield can be further improved through irrigation.

• Despite the small area in homegardens, they can have diversity of species and a complete nutrient cycle ensuring sustainability for the farmers, while meeting their needs. These agroforestry systems are adaptable under a wide range of climate and popular in rural societies.

Some Important Systems for wider expansion

Silvipastoral Systems in temperate hilly zone (e.g. 2.6)

- Extend planting of trees for non-timber products such as fodder, fuelwood and other products. Zizyphus sp., in the form of shrubs and small trees is one of the native species in this area.

- A balance between livestock and fodder resources should be maintained. For this, suitable foliage species should be introduced to increase the fodder production while maintaining the environmental balance.

- Plant multipurpose trees to meet socio-economic objectives. Amygdalus sp., is one of those species which produces good quality foliage for livestock, while its seeds
and latex have industrial use. Being a native species, wider expansion of its cultivation is easy.

- Suitable land husbandry practices are needed to improve the productivity of agroforestry practices.

**Eucalyptus trees on croplands in dry temperate plain zone (e.g. 2.6)**

- Cultivation of species like *Zizyphus spinachristi* along with eucalyptus can provide additional income through good quality fruits.
- Value addition through processing of wood and leaves can create additional employment and income.

**Taungya system (apple saplings on farmland with willow and poplar trees as windbreak) in high mountainous zone (e.g. 2.4)**

- Establishment of plant nurseries for raising grafted plants of superior variety can enable farmers to increase fruit yields apart from enabling them to increase the population of fruit trees and reducing the population of fuelwood species.
- Suitable placement of forestry species for establishing wind breaks around the farm boundary can protect fruit and agricultural crops from cold wind injury.
- Cultivation of flowering plants such as crown imperial (*Fritillaria imperialis*) between apple trees can further improve income. The species tolerant to shade can perform well as inter-crop in fruit orchard as compared to normal food crops.
- Other high value crops such as medicinal plants like *Ferula gummosa*, can also be introduced as inter-crops.
- *Prangos ferulacea* is another good species having high forage quality. Because of the strong smell of foliage, many pests on fruit crops are repelled.

**Silvopastoral system (multipurpose woody hedgerows and livestock) in temperate hilly zone (e.g. 1.11)**

- Tree population can be increased using indigenous and exotic tree species, preferably those which are capable of fixing nitrogen to increase the forage production. Precaution should be taken to assess the suitability of exotic species before introduction. Invader species which have fast growth can eliminate the local species and can cause environmental hazards. Some Acacia species are useful because of their hardiness and utility as fodder.
Silvopastoral system (native trees on pasture) in dry temperate plain zone (e.g. 1.6)

- To improve the productivity, plant species such as *Amygdalus scoparia*, *Populus euphratica*, *Tamarix spp.*, *Ficus carica*, *Phragmites communis* and *Pistacia atlantica* can be introduced in the pasture.

5.3 Scope for adopting India’s agroforestry systems in Iran

To identify and extend suitable agroforestry systems/practices in India and to review their compatibility in Iran, three major recognised land use systems of India (Uttarakhand) were identified. Some of the significant practices adopted in India, were also recognised for enabling the agroforesters and Iranian scientists to explore their use for Iran.

1. Agricultural lands

While several traditional agroforestry systems are currently being used on agricultural lands, there is scope for adopting improved agroforestry systems even under traditional farming systems, based on the land productivity, adaptability of the plant species, demand and marketing potential and profitability. Fulfilment of various service functions may also be considered. Livestock being an important source of income for small land holders, livestock development can be an integral component of agroforestry, to realise better value for forage produced in the system. There is further scope for supporting the agroforestry production system with backward and forward linkages. All these agroforestry systems will not only provide diverse products, but also help in terrace stabilisation, moisture conservation, soil improvement and reduction of biotic pressure on existing forest resources and drudgery. Introduction of improved livestock management alone can enhance the farm income by 40-60%.

2. Rangelands

There is ample scope to improve these lands by adopting improved agroforestry systems viz. silvopastoral systems, energy plantations and multiple use vegetation cover, shelterbelt plantations, vegetative check bunds and stream bank plantations. These systems, if properly managed, can improve biological productivity of these lands and cater to socio-economic needs of the people. Besides ensuring eco-stability and reducing biotic pressure on existing forest resources in the region, these categories of
lands can be developed using a participatory approach. Such intensification of tree population can become an additional source of income from wood, while enhancing fodder and livestock production.

1. Forest lands

The degraded forest area may be developed in such a way so as to support income generation activities or small scale industries by the fringe communities for their economic diversification. Agroforestry systems can be integrated with multipurpose trees, medicinal herbs/shrubs plantation, fruits and nut species. Silvipastorals and energy plantations can be developed based on the principles of Community Forest Management. Well-stocked forests can be exploited for herbs, shrubs, grasses and other non-timber forest products supportive to income generating activities without impairing the objective of their scientific management. Better tree cover on forest lands will facilitate effective soil and moisture conservation, recharging of ground water, improvement in micro-climate and biodiversity. This would indirectly promote sustainable livelihood and improved quality of life.

5.4 Multipurpose trees

The most important characteristics which determine the position of tree species in agroforestry is their capability in combined systems and not being just a forest tree or fruit tree. Sometimes, most of the unknown trees meet this objective better than native ones and this is the role of agroforestry - to discover these species and their potential for optimum use in this sustainable landuse system. Some of the woody perennials and their utilisation according to information collected from locals and experts are listed for Iran and India respectively, which considering their adaptability, can be suggested for different agroforestry systems. Most of these species may be defined as multipurpose trees, which play different roles of fodder trees, fuelwood trees or fruit trees, etc., simultaneously.

5.4.1 MPTS in Iran

All the tree species which are used intentionally or unintentionally in agroforestry systems of the area are *Quercus persica, Zizyphus numularia, Zizyphus spinachristi, Amygdalus erioclada, Daphne mucronata, Acer cinerascens, Lonicera floribunda, Pistacia khinjuk, Rhamnus persica, Amygdalus scoparia, Juniperus polycarpus*, poplar,
fruit trees, walnut, eucalyptus, *Vitex negundo*, date palm, citrus, *Atriplex*, *Tamarix* and *Pistacia atlantica*.

The indigenous tree species which can be simply planted as multipurpose trees in all the plantation programmes as well as agroforestry systems are listed in Table 5.1:

Table 5.1: The utilisation analyse of woody perennials in study area

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Products</th>
<th>Utilisation</th>
<th>Service Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Acacia arabica</em></td>
<td>Arabic latex</td>
<td>Industry, pharmacy, tannery, dyeing</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>2</td>
<td><em>Cerasus vulgaris</em></td>
<td>Fruits</td>
<td>Food</td>
<td>Consumable, Environmental</td>
</tr>
<tr>
<td>3</td>
<td><em>Amygdalus erioclada</em></td>
<td>Fruits, wood, latex</td>
<td>Industry, fuelwood, oil, pharmacy</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>4</td>
<td><em>Juniperus polycarpos</em></td>
<td>Wood</td>
<td>Carpentry</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>5</td>
<td><em>Cersis siliquestrum</em></td>
<td>branches</td>
<td>Hedgerow, Ornamental</td>
<td>Environmental</td>
</tr>
<tr>
<td>6</td>
<td><em>Eucalyptus spp.</em></td>
<td>Leaves, wood, branches</td>
<td>Pharmacy, pulp &amp; paper</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>7</td>
<td><em>Pyrus glabra</em></td>
<td>Leaves, seeds, fruits, wood, branches</td>
<td>Fodder, food, fuelwood, fence</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>8</td>
<td><em>Ficus carica</em></td>
<td>Leaves, fruits, branches</td>
<td>Fodder, food, carpentry, fuelwood, fence, shade</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>9</td>
<td><em>Amygdalus scoparia</em></td>
<td>Leaves, fruits, wood, latex, branches</td>
<td>Fodder, oil, industry, pharmacy, fuelwood, industry, livestock shelter, handicrafts</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>10</td>
<td><em>Quercus persica</em></td>
<td>Leaves, fruits, wood, branches, bark, tannin</td>
<td>Fodder, food, industry, pharmacy, fuelwood, charcoal, fence, leather, ink, medical, photography, constructing, shelter</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>11</td>
<td><em>Vitex negundo</em></td>
<td>Riparian soil conservation</td>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><em>Pistacia atlantica</em></td>
<td>Leaves, fruits, wood, latex, terbantin</td>
<td>Fodder, food, charcoal, timber, shelter, oil, industry, pharmacy</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>13</td>
<td><em>Salix spp.</em></td>
<td>Flowers essence, wood, branches</td>
<td>Pharmacy, handicraft, timber, riparian soil conservation</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>14</td>
<td><em>Populous euphratica</em></td>
<td>wood</td>
<td>timber, riparian soil conservation</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>15</td>
<td><em>Rubus anatolicus</em></td>
<td>Fruit</td>
<td>Food</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>16</td>
<td><em>Rhamnus persica</em></td>
<td>Wood</td>
<td>Industry</td>
<td>Environmental, ornamental</td>
</tr>
<tr>
<td>17</td>
<td><em>Platanus orientalis</em></td>
<td>Wood, branches</td>
<td>Industry, carpentry, fuelwood</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>18</td>
<td><em>Nerium oleander</em></td>
<td></td>
<td>Ornamental</td>
<td>Environmental</td>
</tr>
<tr>
<td>19</td>
<td><em>Daphne mucronata</em></td>
<td>Fruits, branches</td>
<td>Dyeing, fuelwood</td>
<td>Environmental, consumable</td>
</tr>
<tr>
<td>20</td>
<td><em>Celtis caucasica</em></td>
<td>Leaves, fruit, wood, branches</td>
<td>Fodder, food, fuelwood, handcraft</td>
<td>Consumable, environmental</td>
</tr>
<tr>
<td>21</td>
<td><em>Crataegus azaralus</em></td>
<td>Leaves, fruit, wood, branches</td>
<td>Fodder, food, fuelwood, hedgerow, fence</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>22</td>
<td><em>Cupresus sempervirens</em></td>
<td>Wood, latex</td>
<td>Industry</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>23</td>
<td><em>Olea europaea</em></td>
<td>Leaves, fruits, wood</td>
<td>Fodder, food, fuelwood</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>No.</td>
<td>Scientific Name</td>
<td>Uses</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------</td>
<td>------</td>
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<td></td>
</tr>
<tr>
<td>24.</td>
<td><em>Elaeagnus angustifolia</em></td>
<td>Fruits, wood, branches</td>
<td>Food, pharmacy, fuelwood, fence</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>25.</td>
<td><em>Lonicera fluribunda</em></td>
<td>Leaves, wood</td>
<td>Fodder, fuelwood, fence, shade</td>
<td>Consumable, Environmental</td>
</tr>
<tr>
<td>26.</td>
<td><em>Leptodaenia pyrotechnia</em></td>
<td>Leaves</td>
<td>Fodder, soil conservation</td>
<td>Consumable, Environmental</td>
</tr>
<tr>
<td>27.</td>
<td><em>Cotoneaster numularia</em></td>
<td>Leaves, fruit</td>
<td>Pharmacy</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>28.</td>
<td><em>Zygophyllum atriplicoides</em></td>
<td></td>
<td>Soil conservation</td>
<td>Environmental</td>
</tr>
<tr>
<td>29.</td>
<td><em>Zizyphus spinacristi</em></td>
<td>Leaves, fruits, wood, branches</td>
<td>Fodder, food, fuelwood, fence, pharmacy</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>30.</td>
<td><em>Zizyphus numularia</em></td>
<td>Leaves, fruits, wood, tannin</td>
<td>Fodder, food, fuelwood, fence, industry</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>31.</td>
<td><em>Prosopis spicigera</em></td>
<td>Leaves, fruits</td>
<td>Fodder, nitrogen fixation, soil conservation</td>
<td>Consumable, Environmental</td>
</tr>
<tr>
<td>32.</td>
<td><em>Acer cinerascence</em></td>
<td>Leaves, fruit, wood</td>
<td>Fodder, industry, fuelwood, fence</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>33.</td>
<td><em>Tamarix spp.</em></td>
<td>Wood</td>
<td>Construction, soil conservation</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>34.</td>
<td><em>Pistacia khinjuk</em></td>
<td>Leaves, fruits, wood</td>
<td>Fodder, food, oil, shade, fence, fuelwood</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>35.</td>
<td><em>Cerasus brachypetala</em></td>
<td>Leaves, fruits, wood</td>
<td>Fodder, food, shade, fuelwood, fence</td>
<td>Consumable, Environmental</td>
</tr>
<tr>
<td>36.</td>
<td><em>Cerasus mahaleb</em></td>
<td>Leaves, fruit, wood, branches</td>
<td>Fodder, perfumery, ornamental, fuelwood, hedgerow</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>37.</td>
<td><em>Myrtus communis</em></td>
<td>Leaves, wood</td>
<td>Pharmacy, hedgerow</td>
<td>Commercial, consumable, Environmental</td>
</tr>
<tr>
<td>38.</td>
<td><em>Ulmus spp.</em></td>
<td>wood</td>
<td>timber</td>
<td>Commercial, Environmental</td>
</tr>
<tr>
<td>39.</td>
<td><em>Fraxinus oxyacarpa</em></td>
<td>Leaves, wood, branches</td>
<td>Fodder, carpentry, fuelwood, fence</td>
<td>Commercial, consumable, Environmental</td>
</tr>
</tbody>
</table>

### 5.4.2 MPTS in India

At present, the plants which Government agencies commonly use in forestry and social forestry are *Acacia auriculiformis*, *Albizia lebbeck*, *Dalbergia sissoo*, *Eucalyptus sp.*, *Grevillea robusta*, *Jacaranda sp.*, *Leucaena leucocephala*, *Mangifera indica*, *Melia azadirach*, *Morus alba*, *Salix sp.*, *Vitex negundo*, etc. Although these plant species are not native to the area, they may still be preferred mainly because the propagation of these plants is well known and planting material is easily available. So far, in the annual plantation activity, Bamboos, Eucalyptus, Acacia, Albizia, Prosopis, Dalber gia Delonix, Grevillea, Melia, etc. constitute 90% of the plantation programmes, which can very well be replaced by local tree species of the region.

There are some plants such as *Ficus auriculata*, *F. nemoralis*, *F. palmata*, *Litsea monopetala*, *Celtis australis*, *Grewia oppositifolia*, *Boehmeria rugulosa*, *Debregeasia salisifolia*, *Pyrus pashia*, *Toona ciliate*, *T. serrata* which grow from a very low altitude in the valley to a very high altitude while the other group has a very restricted habitat. Plants such as *Ficus hispida*, *F. semicordata*, *Terminalia alata*, *T. bellirica*, *T. chebula*, *Wrightia arborea*, *Litsea chinensis*, and *Artocarpus lacoocha* can be selected for plantation in lower heights (300-800 masl).

The study presented a list of MPTS which are indigenous to regions of Western Himalaya and suitable for agroforestry in particular and other forestry programmes in general and a Model developed by the community for fulfilment of their daily needs. Based on these details, many of these species can be suggested for similar agro-climatic zones of Iran.

**List of Plants:**

18. *Cassia fistula* L., Vern. Kirala, F. Caesalpiniaexae, Fl. Feb.-Apr., upto 1600 m; Fodder, Fuel, Fibre, Timber, Medicine, Nitrogen fixing.
42. *Milletia extensa* Benth. Vern. Gauj; F. Fabaceae, Fl. Apr. – May, Fr. Jul. – Aug., upto 1500 m; Fodder, Medicine, Soil binding, Fibre.


44. *Morus alba* L. Vern. Sahtoot, F. Moraceae, Fl. and Fr. Feb-Jul. – Aug., upto 1500 m; Fodder, Fuel, Medicine, Soil binding, Fibre.


## 5.4.3 Advisable multipurpose trees to be planted in Iran

Table 5.2 shows some of the fast growing and MPTs either indigenous or exotic species, which are common as perennial components in Indian agroforestry systems and can be suggested for different agro-climatic zones of Iran.

<table>
<thead>
<tr>
<th>Fast growing tree species</th>
<th>Acacia mearnsii, Acacia nilotica, Acacia senegal, Acacia tortilis, Ailanthus altissima, Ailanthus excels, Albizia lebbeck, Albizia procera, Albizia saman, Bambusa arundinacea, Calliandra calothyrsus, Casuarinas equisetifolia, Cedrela toona, Colophospermum mopane, Enterolobium cyclocarpum, Grevillia robusta, Leucaena leucocephala, Melia azedarach, Parkinsonia aculeate, Paulownia tomentosa, Pithecellobium dulce, Populus deltoides, Prospis cineraria, Robinia pseudoacacia, Sapindus trifoliatus, Sesbania grandiflora, Sesbania sesban, Tectona grandis, Terminalia arjuna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other MPTS</td>
<td>Acacia catechu, Achras sapota, Anacardium occidentale, Annona reticulata, Annona squamosa, Artocarpus heterophyllus, Averrhoa carambola, Azadiracta indica, Carica papaya, Dalbergia sissoo, Dendrocalamus strictus, Derris indica, Dichrostachys cinerea, Emblica officinalis, Ficus religiosa, Gliricidia sepium, Grewia optiva, Madhuca indica, Mangifera indica, Moringa oleifera, Morus alba, Musa paradisiaca, Nelphelium lappaceum, Psidium guava, Sesbania grandiflora, Shorea robusta, Syzygium cumini, Tamarindus indica, Terminalia arjuna, Zizyphus mauritiana</td>
</tr>
</tbody>
</table>

Some of the above species are explained in details below and in an applicable way:

**Acacia catechu** also commonly called *Mimosa catechu*, is a deciduous, thorny tree which grows up to 15 m (50 ft) in height. Common names for it include Cachou and Black Cutch and known as *katha* in Hindi. It is found in Asia, China, India and Indian Ocean area.

### Uses

**Food:** The seeds are a good source of protein.

**Fodder:** Branches of the tree are quite often cut for goat fodder and are sometimes also fed to cattle.

**Medicinal uses:** More specifically, the extract known as catechu, is used to treat sore throats and diarrhea.
Wood: The tree is often planted for use as firewood and its wood is highly valued for furniture and tools. The wood has a density of about 0.88 g/cm³.

Other uses: Its heartwood extract is used in dyeing and leather tanning as a preservative for fishing nets, medicine and as a viscosity regulator for oil drilling.

Services

Boundary or Barrier or support: The spiny branches serve as brushwood fence for the fields.

Propagation

*A. catechu* can be raised from direct sowing, coppice, planting out nursery-raised seedlings or by stump planting. Although not necessary, it is preferable to place the seeds in boiling water and leave them for 24 hours to cool.

*Tectona grandis* (teak) is a genus of tropical hardwood trees and native to south and Southeast Asia which are deciduous in the dry season. They are large trees and grow up to 30–40 m tall.

Uses

Wood: Teak is a yellowish brown timber with good grains and texture. It is used in the manufacture of outdoor furniture, boat decks, and other articles where weather resistance is desired. It is also used for indoor flooring and as a veneer for indoor furnishings.

Services

Ornamental: *T. grandis* is occasionally cultivated in tropical countries as an ornamental for its large leaves and spreading flower clusters. The species was originally introduced in Malaysia as a roadside and ornamental tree.

Intercropping: Soya bean mixed with *T. grandis* not only makes the latter grow better but also allows harvesting of the bean for food; the soya stems, roots and leaves are added to the soil as fertiliser.

Propagation

Teak is propagated mainly from seeds. Germination of the seeds involves pretreatment to remove dormancy arising from the thick pericarp. Pretreatment involves alternate wetting and drying of the seed.

Shisham (*Dalbergia sissoo*), is an erect deciduous tree, native to the Indian Subcontinent. It is also called sissoo and Indian rosewood. It is primarily found growing along river banks below 900 m elevation, but can range naturally up to 1300 m. The temperature in its native range averages 10–40°C (50–104°F), but varies from just below freezing to nearly 50°C (122°F). It can withstand an average annual rainfall up to 2000 mm (79 inches) and droughts of 3–4 months. Soils range from pure sand and
gravel to rich alluvium of river banks. *Shisham* can grow in slightly saline soils. Seedlings are intolerant of shade.

**Uses**

**Timber:** Shisham is best known internationally as a premier timber species of the rosewood genus, but is also utilised as an important fuel wood and for shade and shelter. With its multiple products, tolerance of light frosts and long dry seasons, this species deserves greater consideration for tree farming, reforestation and agroforestry applications. It is planted on roadsides, along canals and as a shade tree for tea plantations in India.

*Shisham* is among the finest cabinet and veneer timbers. It is used for plywood, agricultural and musical instruments, as well as skis, carvings, boats, floorings, etc.

**Fuelwood:** As a fuel wood, it is grown on a 10 to 15-year rotation. The tree has excellent coppicing ability, although a loss of vigour after two or three rotations has been reported. Shisham wood makes excellent charcoal for heating and cooking.

**Services**

**Shade or shelter:** Used as a windbreak in mango, coffee and tea plantations. These shade-loving crops also benefit from improved soil fertility under *D. sissoo*.

**Reclamation:** Due to its vigorous reproduction through suckers, it is useful for stabilising eroding sites.

**Soil improver and nitrogen fixing:** Heavy litter fall decomposes to enrich the soil with nitrogen, phosphorus and organic carbon.

**Inter-cropping:** It may be planted as one component of a homegarden system, where it contributes to several products. *Dalbergia sissoo* also has an unusual use as a host for orchids.

**Ornamental:** Widely used in urban and roadside plantings in the India and other parts of the world.

**Propagation**

Propagation takes place most commonly by root suckers and also by seeds. The seeds remain viable for only a few months. Seeds should be soaked in water for 48 hours before sowing. Seedlings require partial sun or full sun.

*Shorea robusta*, also known as Sal tree, is a species belonging to the Dipterocarpaceae family. This tree is native to southern Asia which is often the dominant tree in the forests where it occurs. Sal is moderate to slow growing, and can attain heights of 30 to 35 m and a trunk diameter of up to 2-2.5 m. In wetter areas, it is evergreen; in drier areas, it is dry-season deciduous.
Uses
Timber: Sal is one of the most important sources of hardwood timber in India. The wood is resinous and durable, and is sought after for construction.

Fodder: The leaves are palatable for livestock.

Other: The resin of the Sal tree is its use as an astringent in Ayurvedic medicine. Sal seeds and fruit are a source of lamp oil and vegetable fat.

Services
Intercropping: In India, artificial regeneration of *S. robusta* is practiced in combination with crops such as upland rice, maize, sesame and mustard. Good results have also been achieved with mixed plantations in which *S. robusta* is cultivated together with *Tectona grandis*.

Propagation
*Shorea robusta* regenerates naturally through seed and coppice. Direct sowing is the cheapest and best method of artificial propagation although stump plantings, planting out entire plants with balls of earth and container-grown seedlings.

*Grewia optiva* is a small to medium-sized deciduous tree, 9-12 m in height. This is a tree of the subtropical climate and native to India. In its natural habitat, the maximum shade temperature seldom exceeds 38°C and the minimum temperature rarely drops below –2°C in the altitude limits of 0-2000 m. It tolerates frost which is common during autumn and winter. Though it grows on a variety of soils, sandy loam with adequate moisture is ideal.

Uses
Food: The ripe fruits are edible. Raw or cooked, it has a pleasant acid taste.

Fodder: The leaves are rated as good fodder and trees are heavily lopped during winter months when usually no other green fodder is available. Leaves are fairly rich in protein and other nutrients and do not contain tannins.

Fibre: The bark yields a fibre that is used for cordage and clothing.

Timber: It is hard, tough with good elasticity and strength properties. The timber is used for oar shafts, poles, frames, tool handles and other uses where strength and elasticity are required. It is found to be suitable for paper production and the branches are used for making baskets.

Services
Boundary or barrier or support: The tree is often planted in hedges and field boundaries.

Intercropping: The tree is planted with climax grass.

Propagation
Propagation is mainly through nursery raised seedlings or stumps. Pre-sowing seed is necessary to hasten and improve germination as the seed testa is hard. Soaking seeds in cooling boiled water for 12 hours gives the best results. Seeds can be sown direct in the field provided they are watered during dry months.

*Moringa oleifera*, which is simply called "Moringa" is an exceptionally nutritious vegetable tree with a variety of potential uses. The tree itself is rather slender, with drooping branches that grow to approximately 10 m in height. The "Moringa" tree is grown mainly in semi-arid, tropical, and subtropical areas. While it grows best in dry sandy soil, it tolerates poor soil, including coastal areas. It is a fast-growing, drought-resistant tree that is native to the southern foothills of the Himalayas in northwestern India.

**Uses**

**Fuelwood:** Has a wood density of 0.32 (air dry) 4600 kcal/kg. Burns very fast.

**Fodder:** Leaves are used.

**Food:** Young pods are eaten; dried seeds eaten like peanuts; root from seed-grown trees used as a substitute for horseradish.

**Other:** Oil from seeds is known in trade as Ben or Behen oil and used locally as edible oil, for illumination, lubrication and cosmetics; bark and leaves are reported to be medicinal.

**Services**

Light crown density allows it to be interplanted with many kinds of annual crops.

**Propagation**

The propagation is done through seedlings, cuttings and direct sowing while there is no need for seed treatment.

**Choice of MPTS for different rainfall situations**

Based on the nature of growth, economic end-product, good coppicing ability and ability to withstand heavy lopping, tolerance to drought, extremes of temperature and ease of establishment, MPTS have been identified for different annual rainfall areas of various dryland regions in the country as given in Table 5.3.
Table 5.3: Tree species suitable for different rainfall situations in agro-climatic regions

<table>
<thead>
<tr>
<th>Annual rainfall</th>
<th>Tree species</th>
<th>Agro-ecological zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (&lt;500 mm)</td>
<td>Acacia nilotica, Acacia aneura, Acacia tortilis, Acacia catechu, Acacia senegal, Casuarinas equisetifolia, Colophospermum mopane, Faidherbia aculeate, Faidherbia albida, Pongamia pinnata, Prosopis cineraria, Prosopis juliflora, Pithecellobium dulce, Tamarix aphylla, Tecomella undulata, Zizyphus mauritiana</td>
<td>Central zone (Markazi, Qazvin, Qom, Semnan, Tehran)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Southern coastal plain zone (Bushehr, Hormozgan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arid southern zone (Jiroft, Kerman, Sistan and Baluchestan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khorasan zone (Khorasan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arid central zone (Esfahan, Yazd)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khuzestan zone (Khuzestan)</td>
</tr>
<tr>
<td>Moderate (500-750 mm)</td>
<td>Acacia mearnsii, Acacia nilotica, Acacia ferruginea, Adathodaviscia, Alnathus excelsa, Albizia lebbeck, Albizia amara, Anogeissus latifolia, Azadirachta indica, Butea monosperma, Cassia fistula, Cassia ciana, Casuarinas equisetifolia, Dalbergia sissoo, Dalbergia latifolia, Leucaena leucocephala, Pedonaco viscosa, Pongamia pinnata, Quercus sp., Tamarindus indica, Terminalia alta</td>
<td>Central Zagros zone (Hamedan, Ilam, Kermanshah, Lorestan)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Southern Zagros zone (Chaharmahal and Bakhtiari, Fars, Kohgiluyeh-va-Boyerahmad)</td>
</tr>
<tr>
<td>Good (&gt;750 mm)</td>
<td>Acacia auriculiformis, Acacia nilotica, Acacia nilotica, Alhizia lebbeck, Alhizia procer, Alnus nepalensis, Azadirachta indica, Bauhinia purpuraea, Casuarinas equisetifolia, Dalbergia sissoo, Dalbergia latifolia, Emblica officinalis, Gmelina arborea, Grewia optiva, Grevillia robusta, Hardwickia binata, Melia azedarach, Morus alba, Paulownia tomentosa, Populus sp., Robinia pseudoacacia, Santalum alba, Sesbania sp., Terminalia sp.</td>
<td>Caspian coastal plain zone (Gilan, Golesthan, Mazandaran)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North western zone (Ardabil, East Azarbaijan, Kordestan, West Azarbaijan, Zanjan)</td>
</tr>
</tbody>
</table>
5.5 Support to National Afforestation Plans

Based on the study, the following suggestions are made to improve the National Afforestation Plans for ensuring sustainable development and socio-economic improvement through agroforestry in Iran.

5.5.1 Agrisilvipastoral systems in enclosed forests or rural conventional territories

This project is based on 2 major components.

1. Livestock in forests: Traditional animal husbandry is not only restricted to rangelands, but can also be seen as mobile (nomadic) and semi-mobile (sedentary) in forest areas of Iran. Hence, a parallel can be drawn between Iran and African countries. In the case of nomadic system, livestock displacement can be undertaken inside the forests (Caspian forest areas) or outside the forests (Zagros forest areas). Livestock displacement in the case of semi-mobile can be perceived in the rural boundaries or conventional territories (belonging to groups or households) where presence of livestock is permanent. Commonly found livestock are cattle and sheep, but in some western parts of the country, goats are also maintained.

Considering the expanded traditional animal husbandry in forest areas, this system has an important role in livestock production. Unfortunately, accurate statistics on livestock production and quantity of forest biomass grazed by livestock is not available. Some experts feel that livestock production is earned from grazing in pasture. Undoubtedly, this uncertainty is opposed to the "sustainable development" theory and can be considered as a significant weakness of the policy with several negative side effects in future. Therefore, prior to any step towards forest management, it is necessary to find a logical-practical solution to solve the problem. It may be observed that traditional stock breeding in forest areas has an important role to play in local and national economy, while providing livelihood to rural communities staying inside and outside the forests.

2. Subsistence forests: Except for a part of the forest area in north of Iran, almost all the forest areas are considered as rural conventional territories which can be logically seen as subsistence forests while rural communities who are settled inside or around these forest areas meet their livelihood needs such as fodder, fuelwood,
construction timber, food and medicine from the forests. In other words, their survival is dependent on forests. In such a condition, it is obvious that natural regeneration of forests is difficult and artificial reforestation through fencing of the areas is not practical. So these forest areas will be degraded and eroded if timely action for conservation is not initiated. Therefore, it is necessary to change the perception and attitude about conservation of forests.

The fundamental solution for the problem of deforestation can be to prepare and execute a Local area Development Programme in which sustainable development of agriculture (based on diversified agriculture), rural life (based on varied economy) and natural resources (based on varied services and protection) are covered, as sustainability of these components is closely interlinked. Promotion of integrated projects blending production, industrial, commercial and service functions, involving local communities, can be a key to solve this problem. Small scale modern animal husbandry programme is one such project which should be considered on priority in rural development.

The proposed national project should be based on people’s participation and coordination between various development organisations. It should be noted that semi-mobile traditional stock breeding has more harmful effects in comparison to the mobile system because they have access to large areas for grazing all round the year.

The traditional methods for rehabilitation of local communities in the forest were done by fencing the area covered under afforestation, prohibiting grazing, clear felling of all the trees and reforestation at 2000-2500 seedlings/ha with exotic species (sometimes native) with long gestation. However, the programme ignored the needs of the participating families.

Contrary to the earlier approach, the project should aim at fulfilling the subsistence necessities of the people connected to forest areas. Motivation to participate actively, training, moderating, supporting and leading them to organise themselves are some of the basics in this programme.

The following are principles for ensuring sustainable development:

1. Protection and regeneration of existing trees;
2. Afforestation with multipurpose trees and shrubs for filling the gaps;
3. Providing fuel wood to villagers;
4. Acceptance of scheduled livestock grazing;
5. Economic and sustainable rehabilitation of enclosed forests with multipurpose species;
6. Stop clear felling of trees and protect naturally regenerated species;
7. Ensure diversity of silvicultural management while meeting the subsistence needs of the local communities.

Table 5.4 shows some of the recommended multipurpose trees.

Table 5.4: Recommended multipurpose trees and shrubs for afforestation in Iran

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>No.</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Pistacia atlantica</em></td>
<td>16</td>
<td><em>Ficus carica</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Prosopis spicigera</em></td>
<td>17</td>
<td><em>Berberis sp.</em></td>
</tr>
<tr>
<td>3</td>
<td><em>Zizyphus spinachristi</em></td>
<td>18</td>
<td><em>Salix aegyptiaca</em></td>
</tr>
<tr>
<td>4</td>
<td><em>Zizyphus nummularia</em></td>
<td>19</td>
<td><em>Elaeagnus angustifolia</em></td>
</tr>
<tr>
<td>5</td>
<td><em>Acacia rupestris</em></td>
<td>20</td>
<td><em>Olea europaea</em></td>
</tr>
<tr>
<td>6</td>
<td><em>Acacia sp.</em></td>
<td>21</td>
<td><em>Vaccinium arctosaphyllos</em></td>
</tr>
<tr>
<td>7</td>
<td><em>Myrtus communis</em></td>
<td>22</td>
<td><em>Rhus coriaria</em></td>
</tr>
<tr>
<td>8</td>
<td><em>Pyrus sp.</em></td>
<td>23</td>
<td><em>Cercis sp.</em></td>
</tr>
<tr>
<td>9</td>
<td><em>Malus sp.</em></td>
<td>24</td>
<td><em>Morus sp.</em></td>
</tr>
<tr>
<td>10</td>
<td><em>Pruimus sp.</em></td>
<td>25</td>
<td><em>Castanea sativa</em></td>
</tr>
<tr>
<td>11</td>
<td><em>Diptopus sp.</em></td>
<td>26</td>
<td><em>Corylus avallana</em></td>
</tr>
<tr>
<td>12</td>
<td><em>Mespillus germanica</em></td>
<td>27</td>
<td><em>Juglanse regia</em></td>
</tr>
<tr>
<td>13</td>
<td><em>Crataegus aronia</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td><em>Gleditchia caspica</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td><em>Robinia sp.</em></td>
<td></td>
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</tr>
</tbody>
</table>

The new approach can be named as the modern silvipastoral system to maintain a balance between controlled livestock grazing and silvicultural development. The principles of modern silvipastoral system are:

1. Balancing the livestock quantity, changing the species and their breed improvement;
2. Protecting, improving and rehabilitating the land through watershed management and reforestation using tree species of local needs;
3. Good management practices such as fencing, ploughing, sowing, planting seeding, thinning, pruning, collection of fodder and fuelwood, etc.
4. Development of a suitable mechanism for equitable distribution of the benefits.

Figure 5.1 shows the products, components and their relationship in a modern silvopastoral system.
The impact of the programme can be visualised as follows:

1. Gaining accurate and diverse knowledge for promoting sustainable development;
2. Increase in the value of enclosed forests;
3. Increase in income and socio-economic development of rural communities;
4. Meeting subsistence needs of villagers through local, simple and inexpensive methods;
5. Preparing a practical and beneficial foundation for a sustainable landuse development.

Figure 5.1: Products, components and their relationships in a modern silvopastoral system

5.5.2 Tree farming improvement in north of Iran

Due to adverse climatic conditions of the country which is located on the dry region of the planet, the exploitation of forest resources must be systematic so as to prevent deforestation and land degradation. However, most of the rural communities, particularly those who are located in forest areas are dependent on forests to meet their basic needs such as fuelwood, timber and forage. Many of them even have to cut and
sell wood to meet their cash needs. These activities have an adverse impact on forest conservation.

Some of the denuded forest areas have also been converted into agricultural farms and pastures. These lands due to over-exploitation and neglect, promote soil erosion and depletion of nutrients and become unfit for use. There is increasing wood consumption in the country, mainly in the northern forests. This being the only source of timber, it is necessary to reduce this destructive pressure on the forests.

On the other hand to reduce the unemployment challenge, it is better to improve the income and livelihood of villagers through reclamation of degraded lands, for which an integrated programme is necessary. One of the solutions for this problem is tree farming by planting fast growing and multipurpose trees which is already in progress on public and private lands. There are about 30000 ha of tree planting with poplar species in different forms of intensive block plantations and windbreaks, across the northern provinces of the country. Suitable climate and fertile soils in Gilan, Mazandaran and Golestan in the northern provinces of Iran, support good tree growth and thus, over more than 10% of programme is implemented in these areas.

As per the long term programme of the national green movement in the country, one million ha of tree planting consisting of fast growing (60%) and multipurpose trees (40%), can stop forest tree felling and respond to the demands.

The following recommendations are being made for successful expansion of this programme throughout the country:

1. Publicise and inform the public, particularly the farmers about the benefits of the programme;
2. Pay subsidies for inputs such as seedlings for accelerating afforestation;
3. Promote different systems of forestry for different locations and needs to optimise benefits;
4. Provide credit facilities with suitable terms;
5. Create markets with shopping guarantee.
6. Insure the products;
7. Establish poplar growers’ association.
The Government policies should attract people’s participation for operating the programme. The approach should be to assign tree farming to people along with technical and financial support. The main objectives of the programme should be to promote production of timber, nuts, fruits, herbal medicines, fodder, fuelwood using suitable native and fast growing exotic species. The programme should ensure soil and water conservation and wider biodiversity.

**Programme execution:** This programme can be implemented in four regions which are located outside the forest area.

1. **Central Alborz sites:** This area has adequate water and fertile soils, covering both public and private lands.

2. **Mountainous sites in northern Alborz:** These areas were covered by forests long ago, but now they look more shrubby or resemble pastures due to heavy deforestation. These sites also cover both public and private lands.

3. **Villages surrounded by forest areas:** There are many abandoned wastelands around the villages within and around the forest areas which are suitable for tree farming. These sites, generally slopy and infertile are owned by villagers. The state can encourage villagers to take up tree farming by providing necessary inputs.

4. **Margins of agricultural lands:** Farmers may be encouraged to establish shelter belts on farmland boundaries all over the country.

The predicted outcome of these programmes would be the supply of raw materials for related industries, employment, enhancement of socio-economic levels of rural communities and improvement in the environmental conditions leading to sustainable development.

### 5.5.3 Local forestry for sustainable development of rural communities

Five decades earlier, Iran introduced forestry and silviculture programme in the country to protect the environment and to increase the production of forest products to meet the local needs. This was felt necessary to meet the growing demand for wood and other forest products and to arrest the depletion of natural resources leading to unsustainable land use, as shown in Figure 5.2.
The present study has shown that there is a triangular relationship between agriculture, natural resources and rural communities (Figure 5.3). It means that the sustainability of these ecosystems is closely associated. An unsustainable agriculture is destructive for conservation of natural resources which leads to unsustainable rural livelihood. Degradation of natural resources causes an unsustainable village economy and agriculture. Against this, sustainable agriculture can promote a viable rural economy and consequently, sustainable management of natural resources.
Due to the complex relationship of agriculture with environment, a comprehensive approach is needed to maintain the balance. Sustainable agriculture can be productive while conserving the environment. Agroforestry can provide a solution to maintain this balance (Figure 5.4).

**Figure 5.4: Traditional and modern agroforestry as a land management system**

**Sustainable villages – Sustainable management of natural resources**

Studies on the evolution of relationships between rural societies and natural resources suggest that there is a close relationship between rural poverty and environmental destruction. The sustainability of natural resources will not be practical without eradicating poverty. Poverty creates environmental problems which in turn intensifies poverty. There is a close relationship between rural development and environment sustainability, Thus, sustainable agriculture along with sustainable management of
natural resources would lead to “sustainable village development”. The effective strategy would be to involve the villagers in promoting sustainable development.

**Local forestry**

This approach is also known as participatory forestry, social forestry or community forestry which means forestry with partnership of local people, based on local initiatives. This programme shares the management and its benefits with the local people.

Local forestry can guarantee the conservation and sustainability of forest resources and preserve them for future generations. This should be a political strategy. The implementation should involve local NGOs, Research Institutions and experts, and a coordination committee should undertake regular evaluation and monitoring to ensure success.

**Consequences**

Some of the advantages of local forestry are listed below:

1. Sustainable management of natural resources;
2. Cooperation and improving the relationship between local communities, Government, society and private organisations for landuse programmes.
3. Resolving disputes among villagers using forests;
4. Increasing profitability with value addition resulting in national economic growth;
5. Decrease in poverty and improvement in their livelihood;
6. Biodiversity conservation

This programme can help in developing all the wastelands under conservation, either through forestry, agroforestry or pasture development. This project can directly or indirectly decrease the dependency of villagers on the forest resources, while they can earn their livelihood through improved animal husbandry and agroforestry. In addition, encroachments, illegal land transfer and landuse would be restricted. The country can march towards sustainable development.

**5.5.4 Support to Forest rehabilitation through Tooba plan**

For rehabilitation of degraded forests, the Government of Iran has identified forest rehabilitation as one of the top priorities in the third Five Year Developing Plan under
the TOOBA project since 1999. The main objective was to promote planting of fruit species and multipurpose trees on degraded national and private lands located all over the country, involving local people and cooperatives, using a “bottom-up” approach. The goal was to improve the economy through employment generation and increase the production of non-wood products, while protecting the soil fertility. The project aimed at the participation of local cooperatives and NGOs and supporting land owners with inputs and technology to improve employment generation and their income, while conserving the natural resources. The outcome of this study can strengthen this programme with suitable selection of tree species and their placement to optimise their growth and production.

Figure 5.5: A picture of Tooba project in study area

Thus, the findings of this study can contribute to extremely valuable technological inputs for various ongoing afforestation and natural resources conservation programmes in the country. The study suggests the introduction of both native and exotic species which can generate basic needs for the local communities and produce marketable surplus to earn cash income. The study further suggests the need for integration between various development agencies to enhance the productivity of agricultural crops, livestock, forests and grasslands, while generating gainful employment for local communities, who are struggling for their survival.