

# *Silvipastoral Systems in Arid and Semi-arid Regions*

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## **ABSTRACT**

The silvi-pastoral systems have been in practice for centuries in hot arid and semi-arid regions of India, new technical and socio-economic approaches are needed to increase productivity and sustainability. The complexity of process that determines the responses of grasses and trees to the environment and to each other requires large scale scientific assessment involving both "on station" and "on farm" researches. However, beneficial an alternative model of land utilisation may be. It will only be adopted if it is culturally and financially sound. But on the basis of available evidences from the researches carried out so far, it could be concluded that if compatible tree species are properly incorporated on pastures or on farm lands, over all biomass level could be enhanced, even under unfavourable climatic, edaphic and economic conditions in arid and semi-and regions.

## **INTRODUCTION**

**A**gronomic researches- have shown that under specific soil and climatic conditions, planting certain combinations of crops and trees simultaneously or sequentially can increase efficiency resource use (Gupta and Gupta 1993). India accounts for about 15% of the total livestock population of the' world with

only 2% of the total geographical area. Due to ever Increasing population pressure of human and associated demands, there is little possibility of allocating arable areas for forage production. Therefore, the increase in forage production is expected from the lands otherwise suitable for sustainable agricultural production. Vast tracts of such lands which are

suitable for forage production are available in arid and semi-arid regions of the country. In India 12 million ha area. is said to be under permanent pastures and grazing lands but biomass production for this land meagre (Singh 1989). Similarly, based on the recent surveys, 158 million ha area is classified as wastelands (Singh 1989) . This provides ample opportunities to exploit. such lands for production of forage and fuel wood. Integrated silvi-pastoral system of farming is low input technology for efficient utilisation of marginal and sub-marginal lands, especially in arid and semi-arid regions. Through this, forage and leaf fodder IS obtained besides timber and fuelwood. This seems to be most effective proposition to feed our livestock 111 and and semi-arid areas.

### **Silvi-pastoral Systems:**

**Some Crucial Issues :** The agro-forestry research and development, whose silvi-pastoral system is an important. Component, is highly useful because rural poor are commonly portrayed as being its primary beneficiaries-. Silvi-pastures. like other agro-forestry based systems is a land use particularly suitable for resource poor marginal lands, even for wastelands. Because such lands are usually owned and cultivated by poor and small farmers and therefore, researches in silvi-pastoral systems should be promoted as a way to improve social equity by increasing productivity of poor lands. Before, initiating any silvi-pasture development programme, thorough knowledge of local socio-ecological environs should be gathered.

ICRAFs diagnosis and design (D and D) methodology has been found highly useful in identifying silvi-pastoral potentials for a particular locality or area or region and this in tum is quite helpful in setting priorities for research. In fact, these are the fundamentals for the success of any silvi-pasture establishment programme. Stand Management:

To manage the silvi-pasture stands. it is absolutely essential to I have clear cut idea of general objectives of the programme-such as to improve the well being of poor people in a defined social and bio-physical circumstances- and also the specific objectives such as to sustain yield at certain level In silvi-pasture research and development programmes it is always assumed that objective is to increase yield.

### **Seed Production Aspect:**

Perennial grasses and tree species often pose seed production problem seed opening, sudden and untimely seed collection and storage, etc., are common problems associated with grass seed production. In case of tree species, light fluctuations in seed setting, seed dormancy, collection and storage problems. poor germination, silvi-pasture development programme and therefore. maximum attention should be given to production aspect of grass as well as of tree seeds.

Planning for silvi pastures Anyone wanting to implement silvi pastures should “build a team and plan, plan, plan.” Seeking advice from those who have implemented silvi pastures, working with others who have expertise in trees, forages and livestock, and getting feedback from those who contribute to the farm operations (e.g., custom applicators) can save time, money and frustration. Consideration, too, must be given to layout, compatibility with forage species, appropriate protection from livestock and equipment, and long-term management needs.

### **Silvi-pastures and Extension Strategies:**

Under ideal conditions the mechanism by which the technologies and techniques are transmitted-are simply the links of researchers with the farmers in a Circular system with balanced flows of information and feedback. But this has not yet affected agro-forestry and silvi-pastoral extension programme in India.

Indeed the need of extension in these fields has been recognised only recently (Warren, 1993). The demonstration of successful silvi-pasture in a treeless landscape has been the primary tool for expansion of such systems. Managing such systems by Village level cooperatives are very successful in some areas (Barua, 1990). Such participatory approach for extension of silvi-pastoral system establishment in village common lands can be highly rewarding. Non-governmental organisation can also play an important role in promotion of silvi-pasture development by imparting education to farmers in this technology as inspite of the fodder and fuel wood supply crisis; farmers are still reluctant to take up such systems in their own lands. Three basic regions for this-hesitant adoption of silvi- pasture and other agroforestry techniques under farmers fields condition are that:

- Only few silvi-pasture models are suited to field conditions.
- Extension efforts to create awareness about benefits of such system are weak
- Infrastructural facilities are lacking to make such systems viable.

### **Tree selection**

Tree selection is critical because, as one Virginia forester says, “You can grow almost any tree almost anywhere for a period of time – but not necessarily well.” As much as possible, trees should complement the farm operation, not compete with it. Typical attributes for tree selection include marketable timber, high-quality wood, rapid growth, deep-rooted morphology to reduce competition with forages, open canopy to allow more light to the forage understory, early leaf-out and late leaf-drop dates, drought tolerance, production of additional products (e.g., nuts, fodders, pine straw) and provision of environmental conservation services. Other important criteria include cost, labour, site suitability, resources

required for establishment and management, and the land’s tenure constraints. Because no tree species will meet all of these criteria, selection should be a “best match” with the producer’s goals and resources. For many, trees will first be part of an animal comfort strategy – to relieve heat stress in summer or to provide windbreaks and shelter in winter – or as secondary feed sources. Others may be as interested in tree products, whether marketed as commodities (e.g., pine straw or greenery, nuts or fruits) or as value-added goods (such as wreaths, ciders, acorn-fattened or apple-fattened hogs).

Creating wildlife habitat for hunting leases is another common goal. Of course, these aims are all academic if on-the-ground resources such as soils or climate aren’t amenable to a producer’s trees of interest. Combining different tree species may be a useful practice that can serve multiple functions. Planting rows of conifers on either side of hardwood timber trees can provide a windbreak and simultaneously force the hardwoods to adapt a straighter and less spreading growth form, thus reducing pruning. The conifers may be harvested for pulpwood, providing much earlier returns to the system than possible with hardwoods alone. Mixed plantings also may be useful where trees have complementary or offsetting features. For example, black walnut trees have long rotation times and release compounds that are detrimental to legumes. Thus, planting several black locusts between the walnut “leave” trees within rows could offset the negative effects to clovers because the locusts fix nitrogen and reach harvesting size at an earlier age.

### **Layout**

Planning the silvi pasture layout should not be underestimated. Tree planting density and spatial arrangements will vary based on the amount of shade the species casts or the water required. Layout also should consider

prevailing winds, animal movement, infrastructural needs and aesthetic appeal. Clumped arrangements can be visually appealing and beneficial for some tree species, but most plantings are laid out in rows. Thus, row orientation becomes an important factor for optimizing light to the forage understory, with north-south rows preferred at mid-to-higher latitudes, and east-west orientations favoured at low latitudes. However, this must be balanced with other considerations. For instance, layout must accommodate rotational grazing and appropriate feeder and waterer placements, which are essential parts of good silvi pasture management. And to avoid serious headaches, designs also must account for future tree growth and leave room to move or turn around equipment in the field.

Vegetation control, killing and removing the existing vegetation typically are considered essential steps for tree establishment, although this is somewhat species dependent. For example, pines such as slash and loblolly are fairly robust and may tolerate planting into ground cover; however, shortleaf and Monterey will not fare as well. Even with tolerant species, the release from competition will speed tree growth. For those averse to herbicides, tillage can be used to kill and break up existing vegetation at establishment. Intense grazing pressure may also be used to weaken forage stands. After planting, mats, mulches or judicious mowing or grazing can be used to suppress vegetation, but herbicides generally have greatest effect and economy for vegetation control.

### **Establishing silvopasture**

Silvi pasture systems can be established in one of two ways by: 1) thinning existing woodland, or 2) planting trees on existing pasture. The former requires thinning of trees to a level that supports forages, and requires removing trees to create corridors. The latter involves planting of single or double rows of

trees with forage corridors between them or in groups or blocks (non-linear plantings).

### **Some additional considerations**

Silvi systems are dynamic and change (and will require input) over time. Maintaining adequate light to the forage understory may require thinning or pruning – but this can have other benefits. For instance, trees with clean boles can have substantially greater timber values when premiums are available for high-quality logs, and removing small limbs can be done fairly readily during the off season. Although economic analyses are limited, greater returns generally accrue to silvi pasture systems that incorporate routine tree maintenance.

### **CONCLUSIONS**

Given the state of timber economics, producers looking to make large returns from growing a couple of acres of average-quality timber trees may face disappointment. However, even small plantings offer opportunity to improve animal comfort and performance, protect environmental resources and create more appealing landscapes while diversifying farm income streams. The big challenge for implementation is a willingness to manage complexity and to think in time-period scales not common in the agricultural community.

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