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Afforestation with multi utility plants – A new strategy for Conservation of Biodiversity

Science

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ABSTRACT

The earth holds a vast diversity of living organisms, which includes different kinds of plants, animals, insects, and microorganisms. The earth also holds an immense variety of habitats and ecosystems. The total diversity and variability of living things and of the system of which they are a part is generally defined as biological diversity, i.e. the total variability of life on earth. In other words it also refers to the totality of genes, species and ecosystems in a region. Biodiversity includes diversity within species, between species and of ecosystems. Biodiversity is essential for maintaining the ecological functions, including stabilizing of the water cycle, maintenance and replenishment of soil fertility, pollination and cross-fertilization of crops and other vegetation, protection against soil erosion and stability of food producing and other ecosystems. Conservation of biological diversity leads to conservation of essential ecological diversity to preserve the continuity of food chains. Biodiversity provides the base for the livelihoods, cultures and economies of several hundred millions of people, including farmers, fisher folk, and forest dwellers. It provides raw material for a diverse medicinal and health care systems. It also provides the genetic base for the continuous up-gradation of agriculture, fisheries, and for critical discoveries in scientific, industrial and other sectors. Biodiversity represents the very foundation of human existence. The rapid erosion of biodiversity in the last few decades has impacted on the health of the land, water bodies and people. Biodiversity is a wealth to which no value can be put. In the final analysis, the very survival of the human race is dependent on conservation of biodiversity. It is evident that this invaluable heritage is being destroyed at an alarming rate due to several reasons. Besides the profound ethical and aesthetic implications, it is clear that the loss of biodiversity has serious economic and social costs. Conserving biodiversity is not an issue confined to any one country or community. It is a crucial global concern. We may appreciate the fact that the most effective and efficient mechanism for conserving biodiversity is to prevent further destruction or degradation of habitats by us. We require more knowledge to conserve biodiversity in reduced space and under increased pressure of human activities. Thus this paper deals with conservation of biodiversity by using a new strategy that is by using multiutility plants for afforestation. It is felt that by growing such plants it will bring rural prosperity besides promoting Afforestation.

The biological diversity of the Indian subcontinent is one of the richest in the world owing to its vast geo-graphic area, varied topography and climate, and the juxtaposition of several biogeographically regions. Because of its richness in overall species diversity India is recognized as one of the12 mega diversity regions of the world. It consists of fertile river plains and high plateaus and several major rivers, including the Ganges, Brahmaputra and Indus. The diverse physical features and climatic situations have formed ecological habitats like forests, grasslands, wetlands, coastal and marine ecosystems and desert ecosystems, which harbour and sustain immense biodiversity. The country is also one of the 12 primary centres of origin of cultivated plants and domesticated animals.

As we all know by now, Biodiversity is essential for maintaining the ecological functions, including stabilizing of the water cycle, maintenance and replenishment of soil fertility, pollination and cross-fertilization of crops and other vegetation, protection against soil erosion and stability of food producing and other ecosystems. Conservation of biological diversity leads to conservation of essential ecological diversity to preserve the continuity of food chains. Biodiversity provides the base for the livelihoods, cultures and economies of several hundred millions of people, including farmers, fisher folk, and forest dwellers. It provides raw material for a diverse medicinal and health care systems. It also provides the genetic base for the continuous upgradation of agriculture, fisheries, and for critical discoveries in scientific, industrial and other sectors. The rapid erosion of biodiversity in the last few decades has impacted on the health of the land, water bodies and people. Biodiversity is a wealth to which no value can be put. In the final analysis, the very survival of the human race is dependent on conservation of biodiversity. It is evident that this invaluable heritage is being destroyed at an alarming rate due to several reasons.

There are several strategies which are adapted for conservation of Biodiversity.

In-situ Conservation
Conserving the animals and plants in their natural habitats is known as in situ conservation.

Ex-situ Conservation
Ex-situ conservation of plants and animals preserve/ or protect them away from their natural habitat.

Conserving biodiversity is not an issue confined to any one country or community. It is a crucial global concern. The Ministry of Environment and Forests constituted the National Afforestation and Eco-development Board (NAEB) in 1992. NAEB has evolved specific schemes for promoting afforestation and management strategies which help the states in developing specific afforestation and management strategies and eco-development packages for augmenting biomass production through a participatory planning process of joint forest management and microplanning.Conservation strategies based on present demands and immediate future needs need to be prioritized. Besides the profound ethical and aesthetic implications, it is clear that the loss of biodiversity has serious economic and social costs.

We may appreciate the fact that the most effective and efficient mechanism for conserving biodiversity is to prevent further destruction or degradation of habitats by us. We require more knowledge to conserve biodiversity in reduced space and under increased pressure of human activities. Thus this paper deals with conservation of biodiversity by using a new strategy that is by using multiutility plants for afforestation. It is felt that by growing such plants it will bring rural prosperity besides promoting Afforestation.

Afforestation: Meaning, Importance and Current Efforts
Afforestation is the effort to plant trees in barren lands so as to create a forest. The term should not be confused with reforestation, which is the process of specifically planting native trees into a forest that has decreasing numbers of trees. While reforestation is increasing the number of trees of an existing forest, afforestation is the creation of a 'new' forest. It is important because it helps check the over-use of natural resources by providing an alternative source pool. Our Earth has been constantly trying to cope with the way in which human beings use natural resources, clear forest lands, cut trees, and contaminate the air, land, and water. Industrial revolution, population bursts, and pollution create permanent damage to the earth, and the result is global warming and climate change. In such situations, something that can help extend the life of the planet and its liv-

ing organisms is the increase of natural resources and decrease of exploitation of these resources. By planting trees and creating forests, many of the commercial needs of human beings are fulfilled, while not destroying what is left of the planet. Afforestation is, therefore, a practice that has been propagated by government and non-government agencies of many countries as a way to stop over-exploitation of nature.

· **Importance**

It restores ecological balance of all eco systems. It maintains biological diversity. It acts as catchments for the soil and water conservation. Planting tress can stabilize soils by increasing interception, Bring soil together and prevent soil erosion Prevent floods and safeguard future of the tribal people. Stabilized the climate and the forest products. Many countries have introduced the practice of planting trees along with agricultural crops in croplands.

The benefits of this practice, which is called agro forestry, are:

It provides a supply of timber, fruit, and fodder for cattle apart from crop production

It prevents soil erosion

It enables better retention of water

It shields crops from excessive wind and sun damage

In terms of the environmental benefits, planting trees is always beneficial whether it takes place in a barren land or is used as a method to regenerate a depleted forest. Trees help check atmospheric carbon dioxide; large scale afforestation can curb the problems caused due to burning of fossil fuels, industrialization and so forth. Thus Afforestation is a positive effort in curbing the over-use and destruction of natural forests. If done with proper planning and at appropriate sites, it can become a commercially viable solution for many human needs without harming the balance of nature.

Afforestation is a programme to protect the requirements of society, economy and environment. In India Afforestation is not a programme but a mission which requires public participation. Blind Afforestation has proved to be non productive. Without knowing the nature and properties of plants, Afforestation programme cannot be profitable. Majority of Sate Forest Department personnel are not aware of the nature and properties of plants. Trees have a significant role in keeping the environment clean, while supporting the livelihood.

To enhance people's participation in tree planting programme, the schemes were modified to integrate livestock with forage production and shift from fuel wood production to income generation by introducing short rotation species with long rotation trees and timber species with fuel wood. Emphasis was laid on extension programmes to motivate local families to take active part in afforestation (Shingi, 1988, Deshpande et al, 1990, Singh, 1990)

Choice of Tree Species for Afforestation

Based on various projects implemented over the last 2-3 decades, it is clear that choice of species is the key to the success of any afforestation programme. When it comes to tree plantation, profitability is the main factor followed by other minor factors such as growth period, demand for produce, level of investment, access to market, availability of planting material and specific local uses, which influence the people to select tree species for planting on their lands.

Selection of suitable species is the most important motivating factor for people's participation as it influences the profitability. Tree planting is being carried out by the people either because they are convinced or motivated by some of the agencies engaged in promoting afforestation. There are very few people who take initiative in establishing plantations of new species, based on the information they have gathered about the utility and profitability of these species. However, most of them are driven by the publicity and attractive benefits as highlighted by the promoters, while selecting tree species for planting on their lands. The popularity of the species also varied from region to region, based on the demand for produce, marketing infrastructure, agro-climatic conditions, available inputs and the extent of awareness and publicity created by the programme implementing agencies.

Tree Species for Income Generation:

A majority of the people prefer growing fruit trees on their marginal and wastelands. This is usually followed by timber, food, fibre, fuelwood, for oil and ornamental purpose. The most preferred among them were Eucalyptus, Mango, Teak, Custard apple and Jujube.

The list of these species with their popularity rank is presented in Table 1

Table 1. Choice of Tree Species

S. No.	Name of the Species	Common Name	Family	*Use
1.	Anacardium occidentale	Cashew	Anacardiaceae	F
2.	Acacia auriculiformis	Australian acacia	Fabaceae	Fu
3	Agave sisalana	Agave	Asperagaceae	Fi
4.	Annona reticulata	Ramphal	Annonaceae	F
5.	Annona squamosa	Custard apple	Annonaceae	F
6.	Azadirachta indica	Neem	Meliaceae	Oi
7.	Artocarpus heterophyllus	Jackfruit	Moraceae	F
8.	Citrus medica	Sweet lime	Rutaceae	F
9.	Cocos nucifera	Coconut	Palmae	F
10.	Casuarina equisetifolia	Casuarina	Casuarinaceae	T
11.	Citrus reticulata	Mandarin	Rutaceae	F
12.	Citrus sinensis	Sweet orange	Rutaceae	F
13.	Dendrocalamus strictus	Bamboo	Poaceae	T
15.	Delonix regia	Gulmohar	Fabaceae	O
16.	Dalbergia sissoo	Shishum	Fabaceae	T
17.	Emblica officinalis	Indian gooseberry	Euphorbiaceae	F
18.	Eucalyptus spp.	Eucalyptus	Myrtaceae	T
19.	Feronia limonia	Wood apple	Rutaceae	F
20.	Jatropa curcas	Jatropa	Euphorbiceae	F
21.	Leucaena leucocephala	Leucaena, Subabul	Fabaceae	T,Fo
22.	Mangifera indica	Mango	Anacardiaceae	F
23.	Moringa oleifera	Drumstick	Moringaceae	F
24.	Polyalthia penult	Ashok	Annonaceae	O
25.	Punica granatum	Pomegranate	Lythraceae	F
26.	Psidium guava	Guava	Myrtaceae	F
27.	Sesbania sesban	Sesbania	Fabaceae	Fi
28.	Santalum album	Sandalwood	Santalaceae	Oi
29.	Syzygium cumini	Jambolina	Myrtaceae	F
30.	Tectona grandis	Teak	Lamiaceae	T
31.	Tamarindus indica	Tamarind	Fabaceae	F
32.	Zizyphus mauritiana	Jujubee	Rhamanaceae	F

*** T -Timber, F-Food, Fo-Fodder, Fu-Fuel, Fi-Fibre, Oi-Oil, O-Ornamental**

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This preference is based on the profitability as well as market demand for the produce and field publicity. Thus, about 50% of tree selected will be fruit species. Among fruit trees, seedlings of custard apple, jujube tamarind, jambolina, drumstick, jackfruit, cashew, Indian gooseberry, wood apple and bullock's heart may be raised in rural nurseries while other species such as mango, guava, pomegranate, coconut, orange and sapota could be raised in commercial nurseries promoted by the Horticulture Department.

Preference for tree species in the order of priority
Fruits and nuts

- Non-timber forest products and oil seeds
- Timber
- Paper and pulpwood
- Forage and fuel wood

The above preference is based on current profitability and subject to availability of good soil, assured soil moisture and easy availability of inputs. The priority may change for different sites, based on adaptability of the species to local agro-climatic conditions, infrastructure for backward and forward integration, investment capabilities, etc. In areas prone to natural calamities, it is better to select hardier species even if the returns are low instead of growing sensitive crops capable of higher returns. There are many useful and valuable species like sandalwood, teak and red shishum, which are highly priced but the gestation period is very long

Bio-diesel Plantation is a wave to promote non-edible oil tree plantations in the country. Major oil seed trees in the country are neem, mahua (Madhuca indica and Madhuca longifolia), pongamia (Derris indica), undi (Calophyllum inophyllum) and jatropha (Jatropha curcus). Among these, jatropha and pongamia have received wider publicity. The Government of India has launched a massive extension programme to promote jatropha cultivation, by projecting very high returns and providing partial financial support for establishing the plantation. The programme with good publicity was launched to cover a larger area. However, the programme faded away as the farmers realized that they were not receiving the anticipated returns. This is an excellent example of how the programme can receive a severe setback if the anticipated benefits are not accrued.

Trees have religious and sentimental values. In ancient Hindu scriptures, uses of many trees for different purposes and their placement in home gardens have been very well described. Establishment of tree groves around the community temples with a wide range of tree species is also a traditional custom. These groves known as sacred groves, with a wide range of naturally grown and introduced trees and shrubs, are protected with respect by the community. Many species of ficus and acacia are also considered holy trees and people generally do not cut them. However, they do not want to plant a large number of such species unless they find some tangible benefits.

Trees are also grown for beautification. Economics and tangible benefits are the primary considerations for selecting tree species. Trees are also planted for beautification, to improve the micro-climate, arrest soil erosion and many other functions. Trees provide an excellent ambience to the site, either residential or work areas. Trees absorb carbon dioxide, thereby reducing the harmful effects of air pollution. Thus, trees act as lungs of our cities to purify air and keep the surroundings cool, healthy and beautiful. Selection of suitable tree species will enhance the aesthetic value and beauty of the surroundings. The selection of species for various locations depends on the size, height and root system. A strong and deep root system ensures better establishment and prevents uprooting by wind.

Tall growing trees with wide branches to provide shade, such as mahogany, rain tree, ficus and rubber tree can be planted to bring the open area under tree groves. Plants like bamboo, bottle brush and weeping willow can be planted along lakes and canals. Apart from plants of small and large size trees, a wide range of creepers with colorful and fragrant flowers can also be introduced. Thorny hedges may be avoided, except for fencing as they require regular pruning.

Table 1. Tree Species

Anacardium occidentale L

Acacia auriculiformis A Cunn.ex Benth

Agave sisalana Perrine

Annona reticulata L.

Annona squamosa L.

Azadirachta indica A.Juss.

Artocarpus heterophyllus Lam.

Cocos nucifera L.

Casuarina equisetifolia L.

Citrus reticulata Blanco

Citrus sinensis L.

Dendrocalamus strictus Nees

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Delonix regia Hook

Dalbergia sissoo Roxb.

Emblica officinalis L.

Eucalyptus globulus Labill.

Feronia limonia Swingle

Jatropha curcas L.

Leucaena leucocephala (Lam.) De Wit.

Mangifera indica L.

Moringa oleifera Lam.

Polyalthia pendula Sonn.

Punica granatum L.

Pongamia pinnata L.

Psidium guava L.

Sesbania sesbania Scop.

Santalum album L.

Syzygium cumini L.

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Tectona grandis L.

Tamarindus indica L.

Zizyphus mauritiana Lam.

Conclusion

While promoting use of multi utility plants for afforestation the preference should be given to rural people. Tree species to be selected should be based on the quality of land, availability of moisture, suitability of climate, growth rate, gestation period, profitability and for fulfilling other specific objectives. While most of the people consider profitability as the primary consideration, beautification, conservation and improving microclimatic are the other considerations. For the success of any afforestation programme income being the primary consideration, arrangements should be made for backward and forward linkages. The extension programme to promote afforestation should be based on well tested technical and economic data to guide the farmers and general public in the right direction.

REFERENCE

• Revised Survey of Forest Types of India by Harry G.Champian and S.K.Seth. Nataraj Publishers, Dehradun, India.Orissa District Gazetteer, Kalahandi District by Sri Nilamani Senapati, Govt. of Orissa | • Principle and Practice of Silviculture by L.S. Khanna, Dehradun, India. | • Our Environment by Leeq Fatehally by National Book Trust, New Delhi. | • GOI. B. Developing India's Wastelands. Ministry of Environment and Forests, New Delhi: 82 pp. (1989) | • Hegde, N.G. Impact of Afforestation Programme on Socio-economic transformation of the Rural Poor. Ph.D. Thesis, Pune University, Pune: 299 pp. (1991) | • Saxena, N.C. Wastelands development for rural needs. Some policy issues. In Wastelands development for fuelwood and other rural needs. Regional Wood Energy Development Programme in Asia. Field Document No. 19. FAO, Bangkok: 149 – 166. (1988) | • Saxena, N.C. Development of degraded village lands in India. Experiences and Prospects. GCP/RAS/111/NET. Field Document No.15. FAO, RWEDP, Bangkok: 55 pp. 1989 | • Shingi, P.M. 1988. Status and prospects for forestry extension in India: An introduction to papers. In Planning Forestry Extension Programmes – India. Edited by P.M. Shingi and C.P. Veer. IIM, Ahmedabad, RWEDP, FAO, Bangkok: 1-8. | • J., Ibrahim, M. & Schlonvoigt, A. 2000 Timber production in tropical agroforestry systems of Latin America. XXI IUFRO World Congress. |