

Agroforestry for Sustainable Rural Livelihood: A Review

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Abstract

Adequate and sustainable access to income and resources such as adequate access to food, drinking water, health facilities and education to meet basic needs is a lifeline. Maintaining a livelihood is a major challenge facing policymakers and decision-makers in the current situation. In this context land-use measures that maintain livelihood security and reduce climate and climate change are needed. Agroforestry can play a key role in bringing about the desired level of diversity and sustainability. Agroforestry has the potential to provide food security and help reduce poverty and its contribution to environmental protection i.e. soil conservation, carbon intake is very important. Traditional farming and management such as agro-forestry may offer livelihood options by simultaneously producing food, fodder and firewood and minimizing the impact of climate change.

Keywords: Agroforestry, Sustainable, livelihood and Rural India.

INTRODUCTION

Agroforestry is one of the most sustainable land management systems practiced around the world due to the socioeconomic benefits that it brings to farmers. In India, farmers practice agroforestry, applying indigenous knowledge.

Fruit trees were planted with wider spacing while forest and fuel wood species were planted with narrower spacing. Farmer's livelihoods improved enormously by practicing agroforestry as they have more access to food, fodder and fuel wood which is reflected by greater access to livelihood capitals. However, farmers have experienced increased incidences of pests and diseases to the annual crops and trees. Agroforestry practices increases species diversity, ensure economic return and sustain farmer's livelihoods.

Livelihoods security is one of the ultimate determinants of nation's wellbeing and overall development. India has reached very close to a situation where renewability of most of the natural resources has succumbed to the magnitude of overexploitation (Chakraborty, Tewari, & Jha, 2009). The gravity of the affair is evident from the fact that livelihood concerns have been expressed in the very first two objectives of the National Environment Policy, 2006 of India (Government of India, 2006) which in its very first principles has recognized human beings as the centre of sustainable development concerns. The ever increasing anthropogenic dependence of the booming populations on ecosystem has outpaced the resilience of the natural resources. There is now ample evidence to

establish that poverty reduction and economic growth can only be sustained if natural resources are managed on sustainable basis (Islam, Quli, Sofi, Bhat & Malik, 2015). A significant segment of India's population, particularly the rural poor, depends on natural resources for subsistence.

The ecstasy of technocratic quests for developmental excellence has grossly built the resilience of the natural resources, including forests. The recent increase in the forest cover of the country is limited only up to its numeric index, since the livelihood dependence has outdone the quantum of green cover increment (Sati & Song, 2012). The disproportionate overload has caused a downturn in goods and services released by the forest and natural resources (Chandra, Soni & Yadav, 2008). The downturn of natural goods and services has encouraged overexploitation fostering socio-economic and Eco climatic hostilities, which have miserably impaired the sustainability of livelihoods (Pandey, 2009). Such a scenario of natural catastrophe has ultimately caused precarious shortfalls in returns from all the bio-production systems, namely- agriculture, horticulture, sericulture, apiculture, forestry, animal husbandry, fishery, goatry, piggery and poultry etc., which support the livelihoods (Sivaji, 2009). The suicides by the farmers and deaths due to hunger in the rural areas corroborate frightening diminution in the basic foundations of livelihoods.

Household livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration). Livelihoods can be made up of a range of on farm and off farm activities which together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement which constitute its livelihood. These entitlements are based on the household's endowments and its position in the legal, political and social fabric of society. In the current scenario regarding livelihood, we have two ways: One is to tolerate the conditions and other one is to change them. In this context, while we are in the first one, we need to pursue the second one. One of the most serious challenges faced by policy and decision-makers in many developing countries for maintain the livelihood security is "how to improve the well-being of the poor in rural areas while maintaining a viable environment". Because of that, agricultural production in the developing countries has seldom matched the needs of the people.

Indeed, many developing countries, particularly those in the dry lands (arid and semi-arid with low forest cover) have not advanced sufficiently in improving food production, because of the recurrence of drought spells and the vulnerability of their fragile ecosystems to degradation. On the other hand, the widespread poverty in developing countries due to slow rates of economic growth has resulted in deforestation and biodiversity loss due to overexploitation, conversion to farmland, slash and burn agriculture, charcoal production, bush fires and harvesting of wood. Hence, on the whole, the natural resource has borne the main brunt of both the agricultural revolution as well as the hard economic realities. Moreover, the profound changes in farming systems, markets and investment mechanisms are exposing smallholders to increased vulnerability and often forcing them to change their traditional farming systems.

This review aims to scrutinize the problems for restitution of resilience of natural resources by specially customized agroforestry systems to revamp the livelihood's sustainability in rural India. Efforts have been made to analyze the factors and reasons responsible for the deteriorations of bio-production systems through scenario analysis for their restoration through eco-friendly land use technology of agroforestry systems. Synthesis of the available literature helped in scenario analysis,

identification of agroforestry models for resolving rural livelihood crisis and strategy for agroforestry development.

AGRICULTURE VIS-À-VIS LIVELIHOOD SCENARIO:

Agriculture, an important base for the rural livelihoods of India, is under serious threats. For decades, food insecurity, poverty and climatic adversity have complimented each other hampering livelihoods of the rural poor, destabilizing sustainable development of this country. Indeed, over the last four decades agricultural production has come under increasing risk due to the adverse climate changes, land and soil degradation. Over 70% of the rural households depend on agriculture as their principal means of livelihood (Government of India, 2015). Small holder agriculture faces many challenges including low productivity, high dependence on rain-fed agriculture, insecurity of the traditional land tenure system and environmental degradation due to unsustainable agricultural practices in rural India (Kumar *et al.*, 1999). As such small holder agriculture remains at low productivity leading to high incidence of poverty, low socioeconomic conditions and livelihood stress among rural small holder farmers (Banyalet *al.*, 2011). Large reductions in resilience may mean that the ecosystems, on which livelihoods are based, break down, causing distress (Government of India, 2006).

Sustainability of rural livelihoods and resilience of natural resources are two vital coordinates of sustainable development of a country. Escalating demand and supply gaps of agricultural produce promotes deforestation and depletion of forests for sustenance, generating a detrimental *poverty-resources degradation* vicious circle. As a result of all that, agricultural production has seldom matched the needs of the people adding much to the rural livelihood crisis, which can only be resolved by replacement of conventional farming practices of seasonal and mono-cropping systems with multitier integrated multiple cropping tree-crop plantations under agroforestry, for expeditious optimization of farming output per unit area of land.

FOREST VIS-À-VIS LIVELIHOOD SCENARIO:

Critical *livelihood – forest linkage* of a huge forest dependent population has been identified as one of the factors affecting forest degradation in India (Forest Survey of India, 2011; Devidaret *al.*, 2010 cited in Nayak, Kohli & Sharma, n.d., p. 4). According to several estimates, India has traditionally been characterized as a low forest cover – low deforestation (LFLD) country exposed to significant direct-human induced deforestation and degradation in past few decades (Devidaret *al.*, 2010 cited in Nayak, Kohli & Sharma, n.d.; Ravindranath *et al.*, 2012). Faster socio-economic progress of forest-dwellers (largely living below the poverty line and facing starvation) depends on forestry development. Consequently, India's forests harness a large potential for livelihood based activities for the forest dependent communities, thus bridging the gap between the poor and forest based market. With such a huge population depending on forest for subsistence livelihood, the strategies for controlling forest degradation need to be focused on reducing the dependence by creating alternative livelihood opportunities for the forest dependent communities, providing alternative technologies to reduce the gap in demand and supply of forest products by adoption of sustainable harvesting practices.

The rural population of India, having majority of marginal and small farmers, constituting around 70 percent of the total population are in habit of complementing the agricultural deficits from the forest resources, leading to qualitative and quantitative deteriorations in forest. The forest degradation and diminishing farm productivity, get enflamed by unsustainable dependence of the

soaring population, which leads to a crisis of livelihoods. The recent “Durban Declaration” (WFC, 2015) during the XIV World Forestry Congress, has underlined the importance of forests as a fundamental source for food security and improved livelihoods and further added that the forests of the future will increase the resilience of communities by providing food, wood energy, shelter, fodder and fibre; generating income and employment to allow communities and societies to prosper; harbouring biodiversity; and supporting sustainable agriculture and human wellbeing by stabilizing soils and climate and regulating water flows. The reports (FAO, 2002, p.6) illustrate that one out of four of the world’s poor relies directly or indirectly on forests for their livelihoods. Forest is an important natural capital, which combines with other assets to sustain livelihoods, especially among the poor (Warner, 2007). People prefer to generate much of their livelihoods from forests because it is a viable option; however for many, forest dependency is often a last livelihood resort (Bryon & Arnold, 1999). Under such a situation revival of the forest resources, by agroforestry, becomes the need of the era.

AGROFORESTRY VIS-À-VIS LIVELIHOODS LINKAGE SCENARIO:

Agroforestry is a viable option for ensuring livelihood security by its multiple usufructs and services. This magnificent land use technology offers an alternative solution to address low land productivity for resource-constrained small holder farmers (Puri & Nair, 2004). Agroforestry technologies have extensively been researched and introduced to small holder farmers in India for over three decades (Bijalwanet *al.*, 2011). Agroforestry continues to support livelihood improvement through production of food, fodder, fuel wood and timber and simultaneous mitigation of the adverse impact of climate change (Islam & Quli, 2016). Despite research and extension efforts during last few decades many small holder farmers have still not adopted agroforestry technologies due to many predicaments (Dagar, 2012). In spite of magnificent contribution, the adoption level of agroforestry systems by small farmers is still inadequate (Islam & Quli, 2016). However, unless farmers widely adopt these technologies as part of their farming system, the potential benefits of agroforestry on livelihoods and the environment will not be realized (Ali & Chaturvedi, 2008).

EMPOWERMENT AND CAPACITY BUILDING OF STAKEHOLDERS

Formulation of a specific plan of work with duties, responsibilities, and rights of the empanelled stakeholders has to be done honestly in the written Plan. Each group of stakeholders like, land owners, record keepers, actual field workers, harvesters and marketing workers etc., should be empowered with regulations for their specific domains of work, to discharge duties and to take appropriate decisions. Agroforestry technology, having lots of interactive concepts and principles, is quite new for the farmers engaged in conventional farming, as such their capacity building plays a decisive role in the success of the plan. The specific training for capacity building of the various groups of stakeholders should be arranged with the support of Govt. / Non-Governmental Research, Education and Training Institutions. The State Agricultural Universities can play a pivotal role in this matter.

CONTRIBUTION OF AGROFORESTRY ON SUSTAINABLE LIVELIHOOD:

Agroforestry has been used as a major strategy to enjoin forest occupants to become partners in rehabilitating degraded forestlands. Agroforestry is a dynamic, ecologically based natural resource management system that, through which the integration of trees/woody perennials in farm and rangelands, diversifies and sustains production for increased social, economic and environmental

benefits. Agroforestry was expected to reduce soil erosion, improve soil quality, vegetative cover, land productivity and uplift the farmer's level of living through sustained farm productivity (Chakraborty, *et al.*,2015) (Figure 1). Agroforestry can play a major role in bringing the desired level of diversification along with sustainability. The farm-industry linkages have also helped the systems to be more sustainable than the traditional cropping systems.(Saxena, N.C., 2000, Kalaba, K.F., *et al.*,2010).

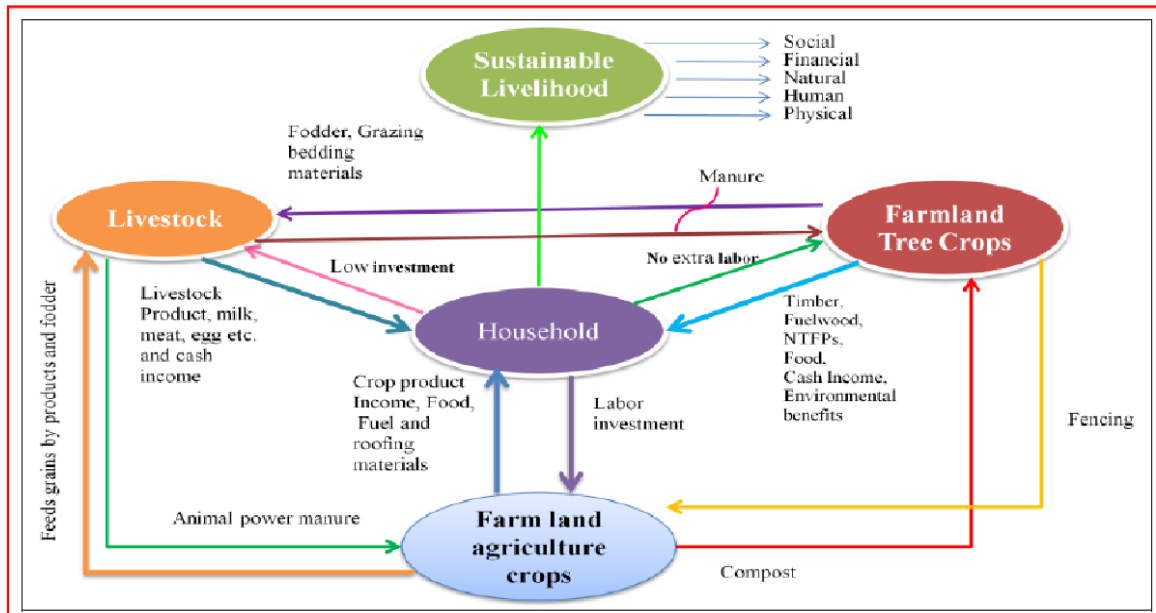
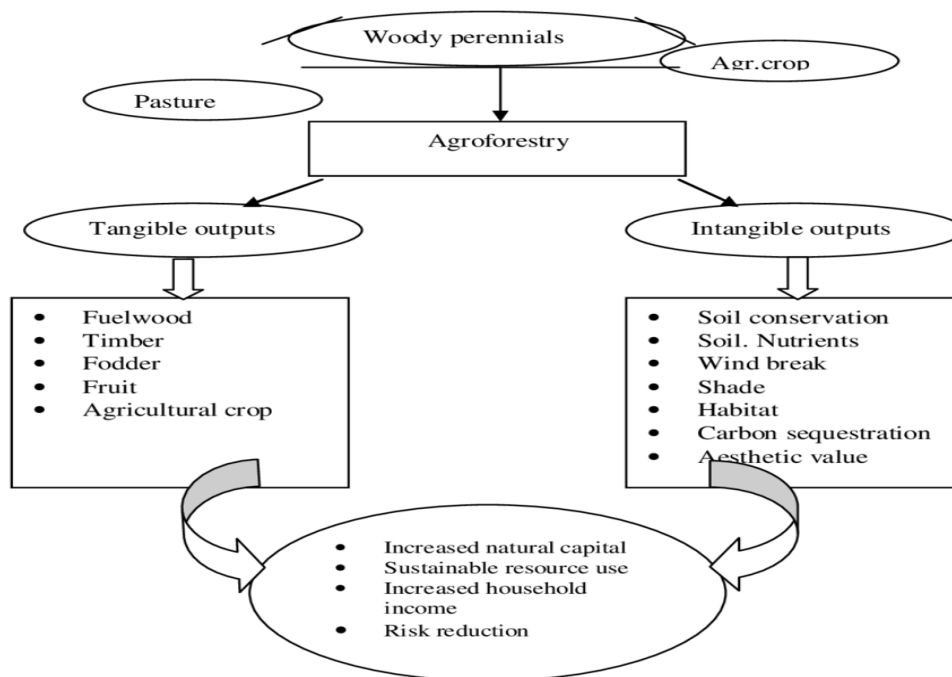


Fig. 1: The contribution of agroforestry in the livelihood of the farmers.

Various patterns of agroforestry systems are practiced in different agro-ecological regions of India which reflects biophysical and social variations. Trees are planted on the borders or within the field, systemically or at irregular intervals, usually with crops such as rice, wheat, pulse, jute, oilseed, sugarcane, vegetables and others, and farmers also grow shade-tolerant crops such as turmeric, ginger and aroid when trees have high canopy coverage (e.g. jackfruit, mahogany). Trees in crop fields work as insurance in case of sudden crop failure or to support crops against environmental hazards and also to provide extra income from trees. Moreover, if there is a failure in one crop, the other crops would supplement the deficit. So, agroforestry is largely evolved with sustainability concerns - resiliency, diversity, and avoiding negative side effects in mind.(Brooks, K.N *et al.* 2005)



The contribution of agroforestry in the livelihood of the farmers.

In such circumstances, traditional land use pattern should be converted into sustainable land use, which will permit maintenance of productivity combined with conservation of the resources. Agroforestry might be the best land-use system for sustainable livelihood in India to cope with the present situation. It is a land based production system that is directly related to food security, employment, income opportunities and environmental issues. Agroforestry also plays a vital role in rural socio-economic development as well as poverty reduction. Likewise, Agroforestry practice increases yield and services of per unit agro-forest area. At present, people are practicing various agroforestry practices all over the country. (Akinnifesi, F.K., *et al.* 2008).

Thus this paper seeks to highlight the important contribution that the Agroforestry making to the livelihood of rural communities including food security, income security, habitat security etc. pointing to the importance of maintaining biodiversity, and the contribution that agroforestry as a type of land use can make to the continued conservation and maintenance of agro-biodiversity.

RECOMMENDATIONS FOR PROMOTING AGROFORESTRY

Keeping in view the magnificent potentials of agroforestry in restoration of eco-climatic and socio-economic regimes of rural areas, which uphold the rural livelihoods, following recommendations (Government of India, 2001) are to be taken care of:

- i. Commercial agroforestry should be practiced in areas where irrigation is available. Suitable species include *Acacia nilotica*, Bamboo species, *Casuarinaequisetifolia*, *Eucalyptus* species, *Populusdeltoides* and *Prosopis cineraria* for different agro-climatic and edaphic conditions;
- ii. High-tech modern nurseries should be established on catchment area basis;
- iii. Agroforestry should be tried in rain fed areas by adopting various agroforestry models that would provide additional income as well as complementing agriculture;

- iv. Elite clones (higher yielding and disease resistant) of important agroforestry species should be developed for different edaphic and climatic conditions. Corporate/ Private sector should also be encouraged to take up R & D activities and promote new agroforestry products;
- v. Agroforestry product research, new product development, new designs and quality standards should be evolved for downstream processing;
- vi. Market information system should be developed to inform farmers about the major buyers, market trends, etc;
- vii. All restrictions on felling of trees, logging, transport and marketing of forest produce should be removed;
- viii. Establishment of agroforestry boards and marketing federations should be encouraged to improve the bargaining power of farmers in domestic and export market.

CONCLUSION

The natural forest resource continues to play a major role in improving the livelihood of rural communities and this it does, because of the rich biodiversity in forests. Thus, natural forests are able to provide for energy, food and nutrition and health. However, the current levels of deforestation which cause land degradation, soil nutrient depletion, loss of natural habitats and therefore change in structure and composition of the natural woodlands. An improved agroforestry system brings significant change in the agricultural farming systems among farming communities and affects farming households. Agroforestry allows the growth of multiple crops simultaneously and provides several livelihood benefits to farming households. Agroforestry also have potential to contribute to the maintenance of biodiversity in natural systems due to the reduction in overreliance of rural communities on natural forest resources, as they are able to maintain their production systems through improved agroforestry systems. Commercial agroforestry important for assured income as compared to traditional, but both forms of agroforestry have specific roles to play in the livelihoods.

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