THREE DECADES OF AGROFORESTRY AND ITS SOCIOECONOMICS:

A REVIEW OF FIFTY ARTICLES

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ABSTRACT

The purpose of this study was to take a fresh look at the nature of available literature, methods used and findings of researches done in socio-economics of agroforestry. Based on a mixed approach the study reviews a number of books, research articles and findings of case studies done earlier. Finally fifty research articles published during 1989 to 2016 were selected for the review purpose. Results show that many researchers and scientists reported a number of socio-economic factors like land holding, land size, gender, marketing aspects, level of education, age of farmers, policy and programmes as some of the factors that influence a farmer's decision on agroforestry practice. Although the results reviewed and presented are based on specific literature, they can be applied in later studies because they are derived through correct and thorough qualitative approach. A big gap is reported in full adoption of all recommended agroforestry practices. It is concluded and suggested that studies on relationship of socio-economic factor and agroforestry practices types as individual and as a whole are required to analyze their influence on adoption and promotion of agro forestry.

KEYWORDS: Adoption, Agro forestry, Constraints, Factors, Socio-Economic

INTRODUCTION

Various scholars working in agroforestry discipline recognized the importance of social and economic aspects of agro forestry. For example, Nair (1993) cited the reference of Scherr and Muller's (1991) report that socio-economic analysis could not be conducted for a majority of the projects owing to lack of data and methods of evaluation. Also, with the wrong choice of species combinations, management practices, and lack of peoples' motivation and understanding, agroforestry may indeed fail just like any other form of land use may fail; nevertheless it will still be agroforestry in the objective sense of the word. Describing such conditions for agroforestry adoption, Carter (1995) described need of access to land on which the farmer has the right to plant trees; rights over trees must be sufficient to justify the effort of planting them and the right to harvest and utilize trees must be exclusive enough to give a return on investment. While studying agroforestry and its socio-economics, Mercer and Miller (1998) did a quantitative and qualitative analysis of published socio- economic research papers and a survey to evaluate the achievements, gaps in knowledge and constraints for closing those knowledge gaps. They concluded adoption behavior of farmers towards agroforestry as top most priority for future socioeconomic research.

According to their findings, concerns over the inadequacy of socioeconomic research in agroforestry began to grow, however, as improved agroforestry systems were transferred from research institutions to rural development projects. In their review, they also studied some factors that influence but not limited to, as policies affecting labor, capital and goods markets, land- tree-tenure policies, and energy policies that still remains a daunting challenge to understand.

Evaluating the role of policy in agroforestry adoption, they confined that a wide variety of policies directly and indirectly influence the ability of agroforestry systems and projects to deliver benefits to individual farmers and the larger society. Later, Vosti et al. (1998) considered the socio-economic aspects such as markets for products, the producer's access to markets, the producer's production capacity, complicated yet clarified the technology adoption picture of a technology. Concern over adoption rates has highlighted the importance of integrating socioeconomic elements into traditional biophysical agroforestry research (Nair, 1998; and Rochelau, 1998). To understand socioeconomic factors affecting adoption, Franzel (2002) considered adoption potential of agroforestry in to three components, via; feasibility, profitability and accessibility. According to him, the establishment of agroforestry systems, however, is expensive in terms of labour and capital inputs, which may discourage their widespread adoption.

Also, recent concerns over global warming and the possibility of earning credits for sequestering carbon may offer an avenue to alleviate establishment constraints (Ginoga, 2002) Later in their study, Mughal et al. (2002) did a broad evaluation of socio-economic aspects of agroforestry and the system practised. In the findings, they emphasized diversion of energies need for on farm experiments so that people adopting agroforestry could judge by themselves performance of scientific models to fulfill the requirements of farmers to a great extent. They noticed that whatever advantages of agroforestry are, model devised should be socially acceptable and economically feasible so that farmers can adopt them without much resistance. Minz and Quli (2002) studied the impact of agroforestry on socio-economic status of respondents. The results of their study revealed a positive role of agroforestry in improving the socio- economic status. Besides social factors, Alavalapati and Nair (2003) addressed others factors like economic and policy issues, and reported that variety of economic and policy issues such as profitability, household benefits, equity, sustainability, soil conservation, environmental services, markets for inputs and outputs, gender, and institutions (property rights, for example) influence the nature and magnitude of agroforestry adoption. Studies that had been done in relation to adoption of agroforestry were later synthesized by Ajayi et al. (2003) These studies have looked at factors that influence farmers to initially establish an improved fallow, a kind of agroforestry practices, those that influence their decision to continue with the practice, and external factors that affect the decision to establish it.

Factors that were tested include wealth status, gender, age, education, labour (with household size used as a proxy for labour), farm size, uncultivated land, use of fertilizer, off-farm income, oxen ownership, and village exposure to improved fallows. His study has concentrated on the improved fallow technology and not the other agroforestry practices. It was found that wealth, labour, farm size, and one's exposure to improved fallows affected farmer decisions to initially establish improved fallows (trial) and to later continue with the practice (adopt), while use of fertilizer and ownership positively influenced a farmer's decision.

In socio-economics, to investigate the perception of farmers towards agroforestry, the crop diversity maintained in agroforestry, the adoption level and the socio-economic and ecological impact of agroforestry on farmers; a study was carried out by Gangadhrappa et al. (2003) Their findings revealed that farmers had a good perception of, and a favorable attitude towards agroforestry and the impact of adoption of agroforestry on social, economical and ecological conditions of farmers is significant. Recognizing importance of characteristics of agroforestry adopters, a literature, summarized by Pattanayak et al. (2003) has made valuable contributions to understanding the characteristics of early adopters, targeting communities and households to promote agroforestry. In this sequence, Thangata and Alavalapati (2003) presented earlier research findings showing a plethora of social, cultural, and economic issues including age, education, income of the

households, awareness and attitude of the households, and the extent of change agent contact influencing the rate of adoption of agroforestry. During the last 10 years, there has been greater emphasis on social and economic considerations. For example, much work has been done to assess the profitability of these practices and their feasibility and acceptability to farmers. In economic perceptive, the development of more sophisticated economic models have created applications that give more realistic and useful results for agroforestry practitioners. Economics and policy were considered as one of the key areas for enhancing the impacts of agroforestry to the first World Agroforestry Congress (Alavalapati et al., 2004). Similarly, Kant and Lehrer (2004) cited earlier studies done by Scherr and Hazel and mentioning the economic importance of resources, the willingness to invest in long-term, economic incentives, and institutional support as necessary elements to support the adoption of new technologies.

Focusing on economic and institutional aspects, they noticed that, although many studies revealed an impressive account of the institutions governing some factors (inputs), specifically land tenure, they totally neglected institutions related to other factors, process, and outputs. Adding to this, Mercer and Snook (2004) cited earlier references of two studies done by ICRAF on adoption aspects of agroforestry in 1997. The first used traditional ex-post analysis to examine the characteristics of past agroforestry adopters. Data were collected via in- person interview on a stratified random sample of farmers. Following the collection of socio-economic and household specific data, the analysis revealed that households most likely to have previously planted trees on their farms were the more educated, more experienced, and relatively wealthier. The second approach, reported here, applied attribute-based choice experiments to examine how farmers value different attributes of agroforestry systems and which combinations of attributes are most likely to be adopted. The goal of this study was to provide information to assist in the design of new agroforestry systems and projects that would be more attractive to farmers. According to them, achieving the full potential of agroforestry requires improving adoption rates to contribute to sustainable land use. Focusing on socio-economic factors as constraints in agroforestry, Mudhara and Hildebrand (2003) assessed constraints to the adoption of agroforestry. They categorized them as land constraints, garden area constraints, labor constraints, cash constraints. Their results indicated that households should adopt Sesbania sesban when it is the only improved fallow practice.

Results of running the model on each of the sampled households indicated that the households adopt improved fallows in the first year, with the number of adopters falling with time. Further focusing on constraints, various scholars have cited many references identifying important institutional issues, such as insecure or inequitable land tenure, social stigmas associated with the technology, distortion in price system. However, none of these references has treated socioeconomic element as a sub system of agroforestry. Adding to this, Thangata et al. (2003) assessed factors influencing adoption and analyzed determinants of agroforestry adoption. In year 2005, Montambault and Alavalapati (2005) conducted an extensive review and analysis of socioeconomic research in agroforestry literature availed between 1992 and 2002. Their results showed a clear increasing trend in publications with more complex analyses, such as econometrics and optimization. They also identified markets, macroeconomics, property rights and gender as some of the factors least studied in agroforestry research. Nkamleu and Mayong (2005) also did a survey to identify factors, that influence the adoption of agroforestry practice by farmers using stratified random sampling procedure and demonstrated factors that significantly affect as gender of farmer, household, family size, level of education, farmer's experience, membership within farmers' associations, contact with research and extension, security of land tenure, agro-ecological zone, distance of the village from nearest town, village accessibility and income from livestock.

Findings of this research also indicated that since adoption of agroforestry practices differ across techniques, generalization needs to be avoided. Safa (2006) also conducted a survey to study socio-economic factor affecting the income of small scale agroforestry farms by comparing determinants and found that net income of agroforestry farms is generally higher than on on- agroforestry farms, thus reported a significant positive effect of agroforestry on the income of small scale farms. Agroforestry requires in-depth social and economic analyses in assessment of economic feasibility of agroforestry systems and factors contributing the adoption of agroforestry (Montaganimi et al., 2007) Relating to this category, Pagdee et al. (2006) reported various variables that influence community forestry, for instance tenure security, clear ownership, congruence between biophysical and socioeconomic boundaries of the resources, effective enforcement of rules and regulations, monitoring etc. For another purpose, Zubair and Garforth (2006) studied the role of farmer's perception and attitudes in farm level tree planting and found that attitude predicts farmer's decision to adopt agroforestry.

They concluded that the limited acceptance of agroforestry activities is also said to be due to lack of attention that researchers and extensionists give to the farmers" views of the factors that influence their decision such as local conditions, cultural values, people's needs and the importance of local participation. While studying association between land holding size and tree density, Dwivedi et al. (2007) carried out a survey of 320 farmers selected by multistage random sampling and random sampling to analyze socio-economics of traditional as well as commercial agroforestry practices. They presented the compiled status of determinants of agroforestry as Fuelwood, additional income, shade, timber and others, finding trees as a prime source of fuelwood (50.6%) and noted that there exists an inverse relationship between land holding size and tree density in farmlands. However maximum percentage of agroforestry (area wise) was reported in marginal farmers. Smallholder farmers, that are often faced with low crop productivity, scarcity of fuelwood and fodder, would be expected to readily adopt agroforestry practices that enable them to increase yields with minimal external inputs. Various scholars have argued on socio-economic studies which have been conducted to learn about farmers' motivations to continue practicing unique, native systems as well as other incentives for some to adopt new agroforestry technologies (Toth, 2007). For example the results of a study done by Darvish et al. (2008) revealed positive and significant relationship among adoption level of agroforestry and socioeconomic variables such as literacy level, level of annual income, awareness level, access to credit facilities, contact with extension agent etc.

Therefore, a clear understanding of the influential factors in farmer decision-making regarding the adoption and maintenance of agroforestry is important. Research has indicated that agroforestry adoption is a decision based on many factors (Mc Ginty et al., 2008). Selecting some of socio-economic variables, Seabrook et al. (2008) stressed upon farmer's economic and educational status, demography, social connections, culture, and resource availability to understand why and how farmers select certain management practices. As agroforestry is technology type of system that requires incurring immediate costs yet the benefits are in the future. This uniqueness of agroforestry is likely to influence adoption in a different way and hence the need for further investigation (Kobwe, 2010) who stated a need to establish the minimum required land size for a farmer to be able to engage in agroforestry practices and the percentage of farmers above that threshold. In India, the second largest populated and one of the fastest growing economy in the world, having several socio-economic issues, which cannot cope with the pace of economic growth. There is a commonly saying in India that "India lives in villages" and it is true that approximately 70% of the population are residing in rural areas and the tremendous growth in economy is does not truly benefits the rural people (Singh, 2010) Mutonyi and Fungo (2011) did a survey study to determine the level of awareness of the various agroforestry technologies for livelihood improvement and

to assess opinions of farmers about the usefulness of agroforestry technologies.

The results of their study came out with the factors that significantly affect adoption home garden practices were land size, level of income derived from agroforestry, land tenure, exposure to technology, training in any agroforestry technology and exposure presence demonstration sites in are. However for scattered tree practice, land tenure found to affect adoption significantly. The study also revealed low level of awareness of the various agroforestry technologies; however they also reported high level of willingness to adopt these technologies if introduced. Later in year 2011, Chauhan and Chauhan (2011) presented a detailed account on constraints such as legal, financial, technical, availability of planting stock, awareness /attitude of farmers etc. in adoption of short rotation forestry. In many recent works, the impact of factors such as credit, information availability, risk, on farmer adoption behavior also has been investigated Irshad et al. (2011) who explored and identified socio- economic factors that affect the adoption of agroforestry practices. These include beliefs and farmers' perceptions towards agroforestry, socio-economic characters of farmers and constraints for development of agroforestry. Among surveyed farmers, 28% had less than 1 acres trees planted land and had monthly average income less than Rs. 8300 per household, 32% farmers were having 1-2 acres possess average income of Rs. 10900.

The farmers with greater area of agroforestry (that is more than 5 acres) have greater income (>Rs. 21500 per month). This truly shows the association between adoption of agroforestry and income, as higher incomes of the educated class to more off-farm employment opportunities and to the higher level of awareness/ understanding for the importance of tree cultivation. He also addressed importance of agro forest and potential economic and social issues related to agroforestry and their implications. The report was set out to explore the beliefs underpinning farmers' perceptions and the role of salient factors that encourage or discourage the expansion of farm forestry. The report also described the constraints to adoption of agroforestry system of the area and other associated issues. They further advised to design and develop new strategies for encouraging farmers to grow trees and improvements in existing systems if characteristics of the farms and farmers in relation to tree growing in existing agroforestry systems are studied. According to Singh and Pandey [40], for agroforestry practice in a particular region or state, we have to critically analyze various factors like existing land use pattern, quality and quantity of land available, cropping system, social forestry implications, policy guidelines and rule of the state governing the control mechanism of movement of timber, present status of 'Forest cover' and 'tree cover' of the state and many others, for scientists, policy-makers and practitioners.

In India, agro forestry practice is extensively done in traditional as well as modern form in many states especially in northern region like Punjab, Haryana, Uttarakhand, Uttar Pradesh etc. Agroforestry is economically, environmentally and socially important for rural people of India. India has only 0.064 ha of forest area per capita as against 0.64 ha of world average and the forest policy also aims at improved productivity to meet both local and national needs (Mukherjee, 2011). Focusing on marketing aspects of agroforestry, (Basamba et al., 2012) reported that only a few agroforestry farmers participate in the marketing of their agroforestry products. Using logit model, he revealed that the socioeconomic factors that affect farmers' participation in agro-forestry market include age, house hold size, education level, farm size, access to credit and number of extension visits. Relating to constraints and farmer's belief, Hussain et al. (2012) explored a study to indentify the belief that underlies farmers' decision to engage in agroforestry in three randomly selected divisional headquarters. In this study, they found out favorable attitudes towards farm forestry system and suggested that planting tree will increase income, and meet household requirements for fuel wood and timber and provide them with a healthy

environment to work.

The conclusion of their study was that, policies and Programme for promoting farm forestry should be sought to intensify or encourage these beliefs especially among those who have not already been engaging in farm forestry. Pisanelli et al. (2012) also found out the potential interest of farmers in establishing Silvo-arable systems. Using on-farm survey and professional technician survey techniques, the research results highlighted both constraints and potentialities for the adoption of Silvo-arable systems at farm level. In their results, almost all interviewed farmers asserted the need to obtain public subsidies due to investment cost and uncertainties of an economic returns. However, 54% of the respondents affirmed that agroforestry systems are not profitable for farmers and that public grants would be necessary in order to make these practices attractive for farmers. Ruheza et al. (2012) recorded socio-economic status in terms of gender, house hold income, family size, labour, age etc and their association with number of planted trees. They observed that most of the farmers were interested in planting tree species as a component of agroforestry mainly for timber production, and soil conservation. Several constraints were identified that limit tree planting in the area, hence affect agroforestry adoption. These included poor extension services, lack of training, low house income, land scarcity, insecurity on land owner ship and utilization of different tree species.

The selection criteria for farmers adoption of agroforestry practices depends upon a number of physical and socio-economical conditions that are related to successful cultivation of perennial crops and in particular trees (Glover et al., 2013). Glover et al. (2013) analyzed a wide range of factors such as house hold security, access to capital and incentives, gender, labor, land tenure, farm size, and knowledge for management addressing the potential socio-economic factors that influence the adoption decision of a farmer for agroforestry practices. This analysis examined some of the main factors above mentioned which are related to adoption of agroforestry techniques. They explained heterogeneity between the individuals and supported the importance of promotion of agroforestry technologies due to its prospect of increasing production and raising farmers' income. They stressed on the involvement of social and economical consideration in adoption of agroforestry technologies and recognizing and tackling of main factors that determine participation of farmers in agroforestry practice and mentioned that it becomes important to understand the main socio-economic factors that determine the actual occurrence of agroforestry and these are: household security, access to capital and incentives, labour, gender, land tenure, farm size and knowledge for management.

According to them, the promotion of agroforestry technologies is important because it offers the prospect of increasing production and hence raising farmers' income. Mukungei et al. (2013) carried out a survey type research study on a total of 160 respondents in four locations selected randomly to determine socio-economic factors that affect farmers' decision to adopt agro-silviculture. The study was limited to households who practiced crop and tree planting on their farms. They studied demographic characteristics, livelihood status, awareness and participation in agri-silviculture practices, education level, and source of information, participation in agroforestry programmes, source and type of tree-crop planted, problem faced when deciding to participate in agro-silviculture and strategies adopted by these farmers to cope up with climate changes. Farmers' decisions to adopt agro-silviculture practices was significantly affected by age of the farmers, gender, level of formal education and contact with agricultural extension staff. Farmers who had adopted agro-silviculture practices in their farms had an increased income level and improved livelihood status. They concluded that most farmers' sale trees to get income for meeting other household needs. They also recommended the need of intensive training and sensitization on adoption of agro-silviculture as a modern agro-forestry technology.

To study impact of socio-economic factors on use of information sources, Surendra and Mahesh (2014) used random sampling to collect related data. Interpreted result indicated that. Sex and land holding were not significant. Age, educational, occupation, farming experience, annual income and marital status were the significant socio economic factors. Mwase et al. (2015) also gave a detailed account on factors affecting agroforestry and evergreen agriculture in South Africa. High initial labour requirement, high cost of input, lack of extension capacity, communal ownership of land, high illiteracy level, small land size, female head household, poor access to appropriate seeds/seedlings, declining soil fertility, extreme weather conditions and absence of guiding policies as hindering barrier to adoption of agroforestry. While factors promoting the adoption of agroforestry were reported as farmers' participation in appropriate technology, availability of herbicides, presence of multipurpose tree species, existence of indigenous agroforestry practices, and pressure on industrial units to participate in tree planting. In similar studies done in Tanzania, Mombo et al. (2016) found five socioeconomic variables viz. farm labor force, farm size, large land holdings, attitude towards land productivity and attitude towards land resource conservation, were found significantly affecting the adoption of agroforestry. The study established that a change in these factors would have influence in the uptake of agro forestry practices.

CONCLUSIONS

The wealth of review on socio-economic research in agroforestry shows that till today, several studies have been done on socio-economics of agroforestry. This review presents technical discussions on various agroforestry practices, economic theories, and methodologies applied by scholars and researchers to assess agroforestry. In the available socio-economic literature on agroforestry, over the past three decades has focused on exploring the biophysical and ecological aspects of agroforestry with an emphasis on social and economic aspects of agroforestry, especially economics, policy analysis, and its valuation. Many researchers and scholars have argued that a number of socio-economic factors like land holding, land size, gender, marketing aspects, source of information, level of education, age of farmers, policy and programmes have impact on agroforestry. As some of the factors that influence a farmer's decision on agroforestry adoption, the impacts of these factors on agroforestry are reflected, and thus can be examined, at different levels in different ways. Although the results reviewed and presented are based on specific case study data, they can be applied in later studies because they are derived through correct, thorough, qualitative and quantitative approaches. It was concluded that some of the studied factors like gender, level of education, were affecting adoption of a particular agroforestry practices for example agri-silviculture, whereas some others such as land productivity, attitude, labor force, farm size etc. were affecting were reported to affect agroforestry as a whole. However, a big gap is reported in full adoption of all recommended agroforestry practices. It is advised to intensify extension services and training programmes so that farmers could motivate themselves to adopt all the latest trends of agroforestry practices. On this way, a great deal of work has yet to be done and hence, it is emphasized and suggested that studies on relationship of socio-economic factor and agroforestry practices types as individual and as a whole are required to analyze their influence on adoption and promotion of agro forestry.

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