



*International Journal of Development and Sustainability*

ISSN: 2186-8662 – [www.isdsnet.com/ijds](http://www.isdsnet.com/ijds)

Volume 4 Number 6 (2015): Pages 721-743

ISDS Article ID: IJDS15040201



# Socio-cultural dimensions of a Jackfruit-Burmese grape dominated agroforestry system in Bangladesh

Rifat Shams, John R. Parkins \*, Brent M. Swallow

*Department of Resource Economics and Environmental Sociology, University of Alberta, 515 General Services Building, Edmonton, Alberta T6G 2H1, Canada*

## Abstract

This study addresses the socio-cultural dimensions of agroforestry systems in the Narsingdi District, Bangladesh within a participatory research and development project. Using participatory rural appraisal methods in two communities results reveal that a jackfruit (*Artocarpus heterophyllus*) and Burmese grape (*Baccaurea ramiflora*) agroforestry system has quickly emerged as the dominant land use. Within this context, certain socio-cultural dimensions associated with farmers' agroforestry practices are identified. These include: relationship with the agricultural environment, traditional practices and knowledge, linkages with friends and families, cultural traditions and specific gendered roles. Each of these dimensions involves a set of cultural norms, values and practices that help maintain agroforestry; for example a local sharing system of planting materials, reliance on local germplasm and dependence on available local resources. The study highlights the importance of understanding and adapting to such cultural characteristics within the design of agroforestry research and extension.

**Keywords:** Cropland agroforestry, Impact assessment, Culture, Gender, Traditional knowledge, Jackfruit, Burmese grape, Bangladesh

Published by ISDS LLC, Japan | Copyright © 2015 by the Author(s) | This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



\* Corresponding author. E-mail address: [jparkins@ualberta.ca](mailto:jparkins@ualberta.ca)

## 1. Introduction

Agroforestry is practiced widely in many rural areas of Bangladesh. In the face of limited natural resources and a rapidly growing population, agroforestry contributes significantly to the multi-dimensional needs of rural people and the long-term health of the natural environment. For this reason, it is considered both an efficient method of resource use and a promising livelihood option to help lift rural people out of poverty (Hauque, 1993; Rahman et al., 2011). Toward this end, the Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), in collaboration with the South Asia Regional Office of the World Agroforestry Centre, developed a project on 'Improvement of Agroforestry Practices for Better Livelihood and Environment' with a goal of 'poverty alleviation and environmental enrichment through agroforestry' (Miah, 2011). The project introduced a set of technical packages to improve existing agroforestry systems in the croplands of three selected districts of Bangladesh. This study contributes to this larger project with a focus on the socio-cultural aspects of agroforestry systems that complement biophysical and economic interests (Atangana et al., 2014). Applying methods that are more common to social impact assessment and community-based environmental assessment (Spaling et al., 2011), this paper describes the emergence of the dominant agroforestry system within Narsingdi district (the jackfruit-Burmese grape system) and then explores important social and cultural elements of this system as identified in the literature and documented by research participants. The basic research question is as follows. How is culture related to existing agroforestry practices in the study communities? With this question at the forefront, the objectives of this study are to: (1) investigate changes to agroforestry practices over time, and (2) identify key socio-cultural dimensions of the established agroforestry system. Insights from this study hold implications for agroforestry project interventions that seek to modify these established systems and the attending social and cultural aspects. In the following sections, we highlight agroforestry in Bangladesh, introduce a conceptual framework for the study of socio-cultural systems and then demonstrate the utility of this approach as it relates to a dominant agroforestry system in Narsingdi district.

## 2. Agroforestry in Bangladesh

With a rural population of over 105 million, Bangladesh has one of the highest rural populations in the world. Only India, China, Indonesia, and Pakistan have larger rural populations, all of which have significantly larger areas of arable land. While the average number of rural residents ranges between 5 and 6 persons per hectare in India, China, Indonesia and Pakistan, the average number of rural residents in Bangladesh is 13.2 persons per hectare of arable land (analysis of data from World Bank, 2015). In response to this very high rural population, Bangladesh has developed some very intensive agricultural systems, including agroforestry systems. FAO (2010) reports that of the total land area of the country of 12,736,000 hectares, 43.5% (5,545,000 ha) has some form of tree cover. Natural forests occupy 9.5%, plantation forests 1.8%, annual crops with trees 7.1%, perennial crops with trees 0.8%, shifting cultivation 2.6%, and rural settlements with trees 21.7%. These rural settlements with trees are otherwise known as homestead forests. It is estimated that there are 13 million homestead forests in the country, which generate about 70% of the fruit, 40% of the

vegetables, 70% of the timber, and 90% of the fuelwood consumed in the country (Miah and Ahmed, 2003 as reported in Miah and Hussain, 2010).

The agroforestry systems of Bangladesh contain a remarkable diversity of herb, shrub, vine, tree and other plant species. Bardhan et al. (2012) analyzed data from five agroforestry and four natural forestry sites in north-eastern and south-eastern Bangladesh and found more tree species in the agroforests (91) than in the natural forests (61). The most common species in the agroforests were mango (*Mangifera indica*), guava (*Psidium guajava*), jackfruit (*Artocarpus heterophyllus*), coconut (*Cocos nucifera*) and betel nut (*Areca catechu*). The literature indicates that a wide variety of minor indigenous fruit are grown in home gardens across Bangladesh, including Burmese grape (Akter et al., 2010; Singh, 2010). We are not aware of any previous study that has found Burmese grape to be as important as was found in the current study.

In rural Bangladesh, a 'homestead' is typically composed of a house and a small area of adjacent land occupied by a household. In homestead agroforestry, rural people utilize their homesteads for cropping in a multi-strata system that includes various types of tree resources (such as trees, shrubs, herbs) in three to seven layers of vegetation. These multi-strata systems represent people's wisdom as well as their necessities, and result in intensive use of the land available even in a small-sized homestead area (Miah and Hussain, 2010; Rahman et al., 2008). Homestead agroforestry is thus an integral part of the life of rural people that contributes to household consumption as well as provides opportunities for income generation with substantial benefits to resource poor and female farmers (Alam and Sarkar, 2011; Miah and Hussain, 2010). In crop fields, farmers grow trees systemically or sporadically or retain naturally occurring plants along field boundaries or within fields in association with the main annual crop (Alam, 1993; Hocking and Islam, 1994; Miah et al., 2002).

### 3. Applications of socio-cultural analysis in the natural resource management literature

Agroforestry is described by Nair (1989, pp. 13) as a sustainable land management system that combines production of trees and crops and/or animals and "applies management practices that are compatible with the cultural practices of the local population," implying an intimate linkage of agroforestry systems with local communities. Despite general acceptance of this definition, much agroforestry research focuses primarily on bio-physical and economic components with limited attention to social and cultural components (Lai, 1991; Mercer and Miller, 1998; Rule et al., 2000; Szymanski and Colletti, 1999). Without an understanding of social and cultural dimensions, the impacts of any technology transfer/extension effort can be constrained (Hoskins, 1987; Rule et al., 2000). For instance, Puri and Nair (2004) note that though significant efforts have been given to promote and implement agroforestry practices in India, modern agroforestry technologies have not been widely accepted by farmers. Limited adoption of modern practices may result from a lack of understanding about the social and cultural benefits that are derived from indigenous agroforestry systems.

Previous programs for improved natural resource management have shown that many did not bring positive impacts. Rather, they had negative consequences and jeopardized the lives and livelihoods of rural people due to a lack of attention to social, cultural and spiritual aspects (Barua, 2010; Cernea, 1990; Merino

and de los Ríos Carmenado, 2012; Verhelst and Tyndale, 2002). The socio-cultural compatibility of agroforestry development projects also has economic consequences. Kottak's (1985) study of 68 projects (cited in Finsterbusch, 1995, pp. 241) states that "the average economic rates of return for projects that were socio-culturally compatible and were based on an adequate understanding and analysis of social conditions were more than twice as high as those for socially incompatible and poorly analyzed projects". There is also growing concern of the need to include cultural considerations in environmental management (Satterfield et al., 2013). Therefore, it is important to address socio-cultural factors in the process of implementing new interventions, so that the proposed interventions can fit with cultural practices, norms and values of the affected people. With this concern in mind, this study is focused on understanding the socio-cultural aspects of agroforestry development in two communities of Narsingdi.

Authors such as Hoskins (1987) and Rule et al. (2000) have helped to define the social dimensions of agroforestry. More recently, Atangana et al. (2014) identified socio-cultural aspects of agroforestry systems, with attention to land tenure, labour, markets and social acceptability of agroforestry improvements. However, we note limited attention to these dimensions of agroforestry in the literature. Therefore we seek to add to this based of knowledge with attention to research on socio-cultural systems in the natural resource management literature more broadly defined. In a study by Jena et al. (1997), a range of socio-cultural aspects such as local knowledge systems, religious practices, traditions, beliefs and festivals were found to be embedded with traditional farming systems based on indigenous Sago-palm trees in the tribal rural community of Kuttia Kondh of India. In addition, authors such as Gadgil and Vartak (1975), Ingles (1997) and Pal (2011) identify religion as a dominant aspect in the management of trees or forests. For instance, in India there are sacred groves which are forest fragments protected by community members who believe that a deity presides over the grove and any kinds of disturbance will crucially affect the local deities causing diseases, natural calamities or crop failure. Focusing on social practices of cropland agriculture, Meinzen-Dick and Adato (2007) found that in some areas farmers trust their informal relationships with neighbors and friends to collect or exchange seeds more than any other source, while in other areas the acts of observing others' fields and learning from others are assumed to be witchcraft.

Another important socio-cultural dimension that has been frequently described by authors is gender. Hoskins (1987) mentions that, agroforestry techniques such as homestead-gardening are more viable in societies where women's mobility is discouraged by the prevailing culture. Maag (1997) describes how men and women differ in their use of forests and trees in the tribal communities of central Nepal, for example, women are more involved with collection of household supplies (lopping trees, gathering firewood and leaf litter) whereas men mainly carry out the propagation and cutting of the trees. This important connection to gender is also highlighted by Trefry et al. (2014) in their study of culture and food security in South Africa.

#### **4. Identifying socio-cultural aspects of agroforestry systems**

Research on the socio-cultural aspects of agroforestry is closely associated with the field of social impact assessment, where baseline assessment of the existing social context is established in advance of specific

project interventions (Burdge and Johnson, 1994; Vanclay, 2002). In this section, we seek to add to the social impact assessment literature by giving specific attention to the concept of culture as it relates to agroforestry systems. Though culture is often narrowly conceptualized (e.g., language or traditional land use), it can be defined broadly as the “complex whole of knowledge, wisdom, values, attitudes, customs and multiple resources which a community has inherited, adopted or created in order to flourish in the context of its social and natural environment” (Verhelst and Tyndale, 2002, pp. 10). This definition illustrates the ‘organic nature’ of culture; in other words, culture is not just an artifact of the past but also evolves as people innovate and adapt to changes over time. Therefore, one of the objectives of this paper is to describe ‘culture’ as it relates to the historical development and current practice of agroforestry in the study context. In this section we identify a preliminary set of socio-cultural dimensions that are related to agroforestry systems. These dimensions are derived from the literature on social impact assessment (Burdge and Johnson, 1994; ICGP, 1995; Burdge, 1994 cited in Vanclay, 2002; van Schooten et al., 2003), cultural resources (King, 1998; King, 2000), and social dimensions of agroforestry in developing countries (Hoskins, 1987; CIDA, 1995; Muller and Scherr, 1990; Rule et al., 2000).

#### 4.1. Relationship with natural environment

Use of the natural environment and dependence on natural resources by communities is a key aspect of socio-cultural practice. Subsistence, religious, recreational or other purposes are cultural expressions of natural resource utilization that reflect people’s material needs as well as the norms, values and practices that shape their lives.

#### 4.2. Traditional/local practices and knowledge

Communities have their own traditional tree planting practices and associated knowledge that are fine-tuned with the socio-cultural setting of the communities. These practices and sources of knowledge influence their land use practices, classification of planting, the species they value, and the way they adapt to change.

#### 4.3. Linkages with family and friends/social networks

Social networks or linkages with both family and the wider community represent the traditional patterns of social interactions among the members of a community that represent key aspects of social and cultural practice. Mallick (2000) notes that, in Bangladesh, knowledge of traditional farming transfers from one generation to another generation by family kinship and learning from neighbors.

#### 4.4. Gender

Gender identities and gender relations are culturally-relevant issues. There are distinctions between women’s work and men’s work in many communities as well as cultural explanations of such distinctions. Ahmed (1993) notes that, in the villages of Bangladesh, women play a more significant role in homestead-

gardening compared to men, where most women are involved with livestock or poultry related work, vegetable production and vegetable seed storage; but their participation remains limited outside the homesteads.

#### 4.5. Norms, values and beliefs

Norms, values, and beliefs function as organizing principles in the ways people work, relate to one another and organize to meet needs within a community. Norms are reflected in common understandings of 'how things are done', what is allowed and what is not allowed with regard to local resource management activities. In agroforestry, farmers' land use practices and tree management, their work distribution inside or outside of their homes, are governed by norms that prevail in the community.

#### 4.6. Religion

Depending on local religious traditions, the practice, uses and management of plants can differ. Bangladesh is predominantly a Muslim populated country with a fairly large proportion of Hindu people. A study conducted by Miah and Rahman (2004) in two different religious communities (Hindu and Muslim) in Narsingdi district, revealed that the Hindu communities had higher coverage and diversity of tree and shrubs in their homesteads than the Muslim communities, as Hindu people depend on various plant species for their religious activities and practices.

These insights from the literature are helpful to gain an understanding of the socio-cultural dimensions that can relate to agroforestry practices in Bangladesh. The intent of the study is to refine this list through investigation within the study area, attending to the novel aspects of culture that are related to the dominant agroforestry systems in the region.

## 5. Methods and materials

Consistent with participatory rural appraisal methods, we used the following data collection methods: informal interviews with key informants, field observation, participatory timeline development, focus group interviews with local farmers, and follow-up interviews in two selected communities of Narsingdi district. Field research and data collection took place in two sub-districts of Narsingdi – Shibpur and Belabo from November 15, 2011 to January 30, 2012. Both of these sub-districts straddle two agro-ecological zones—the terrace ecosystem zone of Madhupur Tract and the floodplain zone. About 37% of the total area of Shibpur and 35% of the total area of Belabo lie in Madhupur Tract (SRDI, 1991; SRDI, 2003). The Madhupur Tract part of the two sub-districts was covered by the agroforestry improvement project. From this area, two villages, 'Kumertek' from Shibpur and 'Chitam' from Belabo were selected for in-depth analysis. These two villages were selected because of relative accessibility for in-depth field research, evidence of long-term cropland agroforestry practices, and clear indications of socio-cultural activity related to local agroforestry practices.



At the beginning of the fieldwork, key informant interviews were conducted with six local people, three in Shibpur and three in Belabo, including a primary school teacher and social worker, officials of the agricultural section in *Union Parishad* (local-level administrative unit) and locally well-known and experienced farmers. These key informants provided firsthand information about the communities, experiences with agroforestry practices, and trends in agroforestry development.

A timeline was created with six elderly farmers to gain a historical perspective on cropland agroforestry systems. This exercise involved the respondents recalling past events chronologically and capturing the major changes and transitions that took place over time. Factors that induced those changes were also revealed. The timeline was constructed in the two communities separately through a meeting with a small group of three elderly farmers in each area. They were asked to describe how and why agroforestry systems have changed over time in the region.

To obtain information on socio-cultural dimensions that are linked with current agroforestry systems, focus group interviews were conducted with local farmers in the two communities separately. The focus group was conducted with eight farmers in Shibpur and seven in Belabo based on a set of questions generated through the literature. At the same time there was flexibility for additional questions to be generated from the discussion.

Since the main project was targeted at cropland agroforestry improvement, data collection in this research was focused on cropland agroforestry. In all cases, the participants were selected purposefully on the basis of their experiences, expertise and knowledge of cropland agroforestry so that they could act as 'information rich cases' (Baxter and Eyles, 1997). Finally, after the completion of the focus groups, follow-up interviews were conducted in-person with three participants from the focus groups and key informants. These interviews generated detailed insights on the issues that emerged as important and highlighted during the focus group and key informant interviews. For instance, additional investigation became necessary on issues related to the prevailing dominant agroforestry system – 'jackfruit-Burmese grape'. Additionally, secondary data was collected to further understand the context of the study areas.

## 6. The study area

Agroecologically, a distinct characteristic of villages in the Madhupur Tract is a terrace which generally stands one to ten meters above the adjoining floodplain (Rashid, 2006). The terrace areas consist of well-drained upland areas locally called "chala" and flood-prone valley areas locally called "baid" (SRDI, 1991; SRDI, 2003). Differences in vegetation can be seen between the uplands and the valleys. Fruit trees such as mango, jackfruit, litchi, jujube, olive, pineapple, banana, Burmese grape are common in the uplands. Under the big fruit trees (such as jackfruit, mango, litchi), various types of spices (such as turmeric, ginger), vegetables (such as cucumber, sponge gourd, chilli, papaya, eggplant/brinjal, bitter gourd) and shorter fruit species (such as lemon, pineapple, Burmese grape) are grown (Figure 1 and Figure 2). In general, the jackfruit-based system is the dominant system in the terrace ecosystems of Madhupur Tract. Rice is the main crop in the valleys.



**Figure 1.** Cropland agroforestry with jackfruit, Burmese grape and eggplant in the upland of Shibpur



**Figure 2.** Cropland agroforestry with jackfruit and pineapple in the upland of Belabo



Shibpur is located about 56 kilometres north-east of Dhaka, which is the nearest city and capital of Bangladesh, and Belabo is located about 79 kilometres north-east of Dhaka. Both sub-districts are situated in the proximity of Dhaka-Sylhet national highway which acts as the main conduit from these regions to the other parts of the country. Within the sub-districts there are well developed paved regional road networks. The study villages have internal local road networks linked with the regional ones, where some are paved and some are unpaved. Also, there are rivers around the sub-districts that play a significant role in communication from these two regions to other places. Figure 3 depicts the map of the study district, Narsingdi, delineating its sub-districts and other important features such as the national highway with the thickest red line. In the inset, the position of the district is shown within the map of Bangladesh (Figure 3).



Figure 3. Map of the study district, Narsingdi (Source: Sarkar, 2006)

The study communities are very small and rural. Kumartek, the village from Shibpur, covers an area of 200 acres with 479 people living in 106 households. Chitam, the village from Belabo, constitutes an area of 219 acres with 766 people living in 167 households (BBS, 2007a). However, according to local informants, the populations of both communities have significantly increased within the last ten years. The literacy rates

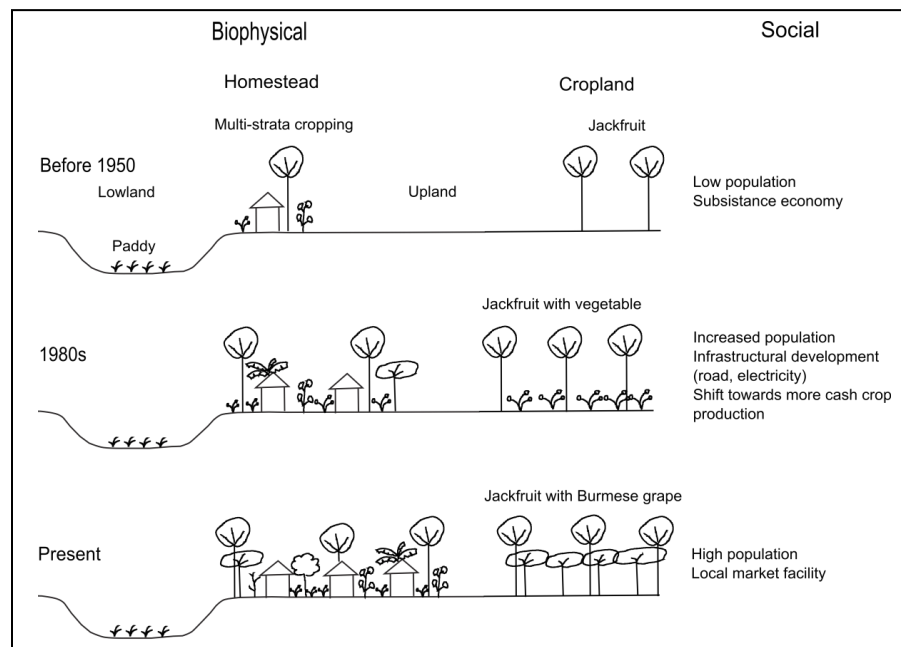
of Kumartek and Chitam are about 36% and 22% respectively among the population older than 7 years (BBS, 2007a). In both villages most households depend on agricultural activities for most of their income, although some are also engaged in non-farm activities such as business, service, non-agricultural labor (e.g. rickshaw/local van pulling, construction worker) and others. In terms of ownership of agricultural land-holdings, about 80% of the population of both villages own agricultural lands in small and fragmented plots (.05 acre to 2.49 acres) (BBS, 2007b). There are smaller numbers of relatively well-off people who own substantial amount of land (above 2.50 acres), and landless people who may have only a very small portion of homestead area but no farm-holdings (BBS, 2007b). Most landless people work as sharecroppers or day laborers.

## 7. Results

### 7.1. Historical development of cropland agroforestry

Timelines were created with participants of the two study communities to enable a collective understanding of the historical developments and changes in their cropland agroforestry practices. A summary these changes is depicted in Figure 4. More than 100 years ago, people only cultivated the low valleys which were favorable for growing rice, the staple food of the country. The well-drained soils of the uplands were not used because they were not suitable for rice cultivation. The population was very low and people grew rice only for their own subsistence. During this time, the main vegetation in the uplands were naturally-growing bushes and reeds (*Phragmites australis*), with a few planted jackfruit and mango trees. People used the reeds for making the roofs of their houses and gradually started growing some fruit trees in the uplands, specifically jackfruit. Fruit and wood from these trees were used for family consumption. Over time, several changes occurred with farmers adopting new crops and species at different times. As the population grew, so grew the demand for food which caused people to initiate more cultivation in the uplands. From the 1950s, people started to grow taro and turmeric under the jackfruit and mango trees. Along with those species, they used to grow peanuts for a period of time. These were the traditional agroforestry practices in the early memories of research participants in both study communities.

After this period, variation between the two regions was noted by the participants in terms of diverging preferences for agroforestry crops grown under the jackfruit trees. Tube wells were introduced in Shibpur during the 1970s and farmers in that area took advantage of the irrigation water to grow more vegetables such as eggplant, flat beans, green pepper and other vegetables. The production of vegetables with some new species such as red spinach and Malabar spinach was further prompted by the introduction of electricity at the end of 1980s that enabled the use of low-lift power pumps for irrigation. In Belabo, the trend was a little different during the 1970s, where farmers started to concentrate on growing pineapple. At this time, an influential person from Belabo brought a new variety of pineapple from another region and this variety spread around the sub-district because of its low investment costs, limited care requirements and quick return on investment. It is in this time period when people started to sell their surplus crops and fruits.



**Figure 4.** Significant changes in cropland agroforestry practices

Respondents noted further changes in the 1980s due to increasing human populations, smaller and more fragmented land holdings, and increased prices of basic commodities. Farmers responded by shifting from subsistence to more cash crops. They started to produce jackfruit, vegetables and pineapples for sale. This change was largely catalyzed by significant infrastructural developments that took place during that time period, such as the construction of the Dhaka–Sylhet national highway, which runs near the area, and the installation of electricity. With the highway development, agricultural products could easily be transported to various parts of the country and so farmers started to obtain higher prices for their products. The improvement of the internal road network in the 1990s made it easier for farmers to carry products to markets using local vehicles, where they could sell directly to wholesalers. According to an informant:

*Before, people did not have the scope for doing this [cash crops]. There were no roads, no power pumps. They do not have any experiences regarding this. There were less people. Now, when they got the scope, they have started this kind of farming [cash crop production] for the increased income.*

During the 1990s, Shibpur farmers started to grow Burmese grape more than any other commercial crop, which is locally called *latkan* (*Baccaurea ramiflora*). Vegetables cannot grow under the shade of the Burmese grape tree. Therefore, the increased cultivation of Burmese grape brought a change in the agricultural practices within the region with a decreased production of vegetables (Figure 5). Burmese grape is not a new species to the region. It has grown for many years in homesteads with other diverse species in the multi-strata system for household consumption at very small scale. But its cultivation expanded significantly when two persons from nearby villages started growing it on a large scale in the 1980s with large commercial

returns. It created a widespread reaction among the farmers of the nearby villages and many farmers started following these commercial producers to grow Burmese grape more extensively. As an added advantage, Burmese grape also grows well in the terraced ecosystem of Narsingdi. Though pineapple has been more popular in Belabo, Burmese grape is becoming more popular in recent years as farmers have realized that cultivation of pineapple leads to reduced soil fertility. Consequently, the trend toward Burmese grape is expanding significantly. During the last few years, farmers are also growing some timber trees such as acacia and eucalyptus.

## 7.2. Current dominant agroforestry system

Participant farmers in all field research activities repeatedly described the jackfruit-Burmese grape based agroforestry system. They find jackfruit and Burmese grape suitable to grow together. According to a timeline participant from Shibpur:

*Burmese grape grows well in the shadows of jackfruit tree. Jackfruit tree is very high but a Burmese grape tree does not grow after a certain height. So now everybody cultivates Burmese grape as an agroforestry crop with jackfruit.*



**Figure 5.** Jackfruit-Burmese grape based agroforestry system, densely grown and unsuitable for growing vegetables



In addition, Burmese grape has become easily integrated into the farming system due to its good economic return as well as its low resource requirements for growing as explained by another timeline participant of Shibpur:

*More money can be earned from Burmese grape. It also takes less care. You need to water once or no matter if not. No cost is involved with it. Wholesalers come from outside and buy directly the Burmese grapes from the fields. The money we can get by selling Burmese grape from one field is higher than that of the money we can get by selling vegetables the whole year round.*

Burmese grape trees start producing fruit 5 years after planting and production increases each year. Trees aged 5-10 years produce 120-200 kilograms per tree and fully mature trees produce 400-800 kilograms per tree (Figure 6). In addition to being very productive, the trees require relatively little time and care and thus provide farmers with opportunities to have spare time to do other economic and social activities.

Farmers have adapted the jackfruit – Burmese grape system so extensively that marketing facilities and local activities have developed to facilitate the system. Morjal Bazaar, a local permanent market, which is located nearest to Shibpur, plays a central role in facilitating the marketing of jackfruit and Burmese grape. The market is situated beside the Dhaka-Sylhet national highway. As jackfruit and Burmese grape are the most valued fruits, during the fruit harvesting season, the market committee facilitates special arrangements for selling these important seasonal fruits by arranging temporary spaces beside the highway. Wholesalers come from different parts of the country to the market and buy the fruits from farmers. Some Burmese grapes are exported to other countries.



**Figure 6.** Burmese grape tree with abundant fruits in growing stage

### 7.3. Socio-cultural dimensions of existing agroforestry systems

Embedded in the changing scenario described above, the socio-cultural dimensions that are associated with cropland agroforestry practices were investigated with research participants, starting with the list of socio-cultural aspects identified from the literature review (see Section 4). Significant variation was not found between the two communities in any of these dimensions.

#### 7.3.1. Relationship with agricultural environment

In both communities, people are found to have an intrinsic relationship with their agricultural environment. The crop and tree resources fulfill their various consumption needs for vegetables, fruits, firewood, timber and others. Also, farmers obtain income through selling fruits, vegetables and timber. In addition to fulfilling their consumption needs, farmers have a shared stock of knowledge, experience and traditions based on these practices. They consider themselves to be self-reliant as they depend heavily on agroforestry activities to meet their basic needs. Though they face several resource constraints such as availability of water, finance and land, they appreciate their way of life as farmers. Dialogue among the focus group participants of Belabo expressed the way they value the association of their life with agroforestry:

*Participant 1: We are definitely proud of agroforestry farmers because I run my family with it. I am mentally satisfied with it.*

*Participant 2: The joy I have, when fruit grows in my orchard knows no bound. The extent of happiness a farmer gets, when fruit is grown in his orchard, cannot be measured. It brings self-happiness, satisfaction.*

#### 7.3.2. Traditional practices and knowledge

Farmers have practiced agroforestry for many decades, enabling them to gather practical experiences and knowledge of agroforestry practices. Participants of Belabo noted opinions about the importance of traditional knowledge on their agroforestry practice:

*We are cultivating trees considering their size, shape and type. We have learned this from the experience of our ancestors. Almost all plants require more or less sunlight while some plants grow well in the shades such as Burmese grape. Pineapple does not grow in shade.*

They also consider their knowledge as sometimes more valuable than that of agricultural officers. One of the participants of Shibpur expressed this in the following way:

*An officer may say that turmeric would grow well in a specific part of the land, but the farmer says that eggplant would grow well in that place. It is seen that the farmer's prediction is right. Farmers have learned by living with the land.*

While they have learned agroforestry practices from their ancestors, farmers are also involved in a continuous process of changing practices and knowledge according to their needs (such as food, money), resources available to grow crops (such as land, water, money), or new problems. They learn to cope with new conditions through their own “trial and error” method or “learning by observing” from other’s success and failure. For instance, farmers learned to grow and value certain local species particularly jackfruit from their ancestors with its variety of uses in their life (such as fruit, timber, and firewood). They continue to grow this species not only for its economic values but also it relates to their family tradition and ancestral ties. They expressed its importance to them over any other species. According to the participants of Shibpur:

*Participant 1: Jackfruit is our traditional fruit. If we find any other tree posing any threat for growing jackfruit, we will stop growing that tree.*

*Participant 2: Jackfruit is our pride.*

After jackfruit, farmers value Burmese grape most which has become an important part of their agroforestry systems in recent years. They have found that Burmese grape is very compatible to grow with jackfruit and requires low resources which are described in the previous section.

Though they emphasize their knowledge on agroforestry, they acknowledged the role of agricultural officers and other experts too. Farmers identified different supports and training that they want from the agricultural offices to address some of the problems they are facing with Burmese grape production. Sometimes there are insects in Burmese grape trees. Sometimes the fruits do not develop properly. Also, they noted problems related to male and female trees. Burmese grape seedlings are either male or female, but it is not possible to distinguish between male and female trees before the first flowering which is 5 years after planting. Male Burmese grape trees do not bear any fruit. In the last five years, some experienced farmers have begun using a vegetative propagation method, grafting, to produce female saplings. But not all farmers can do this as it requires sophisticated skill and experience. In addition, the price of the grafted saplings is high if farmers want to buy them from market.

### *7.3.3. Linkages with family and friends*

In both communities, farmers have strong linkages with their relatives, neighbors and friends that have great influence on their agroforestry activities. A participant of Belabo described this in the following way:

*All the farmers are connected here with each other through the bondage of land. You cannot find this in other part of the world. After observing the production in my orchard, if anyone asks for seedlings from me I will never deny...One farmer voluntarily participated in another farmer’s work. One farmer helps others by giving suggestions.*

The farmers have a ‘sharing’ system of knowledge and seed distribution associated with their production of common species. They produce seeds and seedlings of the common plants by themselves – such as jackfruit, Burmese grape, eggplant, olive, flat beans and other vegetables – and exchange them with each

other. If exchange is not possible, then sometimes they collect seeds by paying money to fellow farmers. In the case of some non-traditional species, however, such as timber species and high-yielding species of jujube, mango and lemon, they need to buy these species from the nurseries or markets. But, farmers have more trust in the quality of seeds or seedlings from their fellow farmers than from similar materials bought from the market. In the former case they can observe the productivity of the plant and feel secure that the planting material can provide good crops, whereas they are insecure about buying planting material of non-traditional species with a higher cost from commercially available sources. The reason for their insecurity is explained by a participant from Belabo:

*We often do not get quality seedlings [of the non-traditional species]. We are being cheated. There are some dishonest sellers who at first sell good seedlings but later on mix bad seedlings with the good ones to have excessive profit. This is becoming a risk for me.*

Besides seed collection, the farmers follow each other's advice and suggestions for tree management, pest control, use of fertilizers and solution of any problem related to agroforestry practices. These relations are also important for the dissemination of tree management issues or species within the village or beyond village boundaries. Sometimes the farmers obtain new seeds from their friends or relatives who live in nearby villages, and if the cultivation of the seeds proves beneficial, it spreads among fellow farmers within the village. The extensive cultivation of pineapple and Burmese grape has been promoted in these villages in this manner.

#### *7.3.4. Cultural traditions*

Agroforestry has important connections to the cultural traditions of the people in these communities. They harvest most of their important fruits such as jackfruit, Burmese grape, mango and pineapple between the months of May and August. They celebrate that time by inviting their relatives, exchanging ceremonial gifts, and sending fruits to relatives and friends. The seasonal fruits – especially jackfruit and its seeds – become a part of their food consumption habit in the harvest season. Traditional cakes are made of it. This is the season when people do not mind if someone else eats ripe jackfruits from their orchards. In contrast, the communities have a tradition of severe physical punishment for any person who steals unripe jackfruits for the purpose of selling. During this season people have extra money in their hands, and well-off families help poorer families so that they do not face financial difficulties and can enjoy this time of plenty. Also people donate jackfruit or other major fruits from their trees for the development of local social welfare institutions such as schools, colleges and mosques. More money is collected by selling those fruits instead of collecting money.

#### *7.3.5. Religion and traditional beliefs*

Religion and traditional beliefs were not found to be important for cropland agroforestry but were important for homestead agroforestry. Hindu families generally grow some specific species in their homesteads such as holy basil trees (local name *tulshi*, scientific name *Ocimum tenuiflorum*) that they use in religious rituals.



There are traditional beliefs around some tree species. For instance, some people believe that planting the neem tree (*Azadirachta indica*) on the south side of their house protects household members from diseases. Also, some think that planting beavertail cactus/*fonimonsha* (*Opuntia basilaris*) and barringtonia/*hijol* (*Barringtonia acutangula*) in a homestead protects the occupants from witchcraft. Many people also grow these species in their homesteads for their medicinal values.

### 7.3.6. Gender

In these communities, differences were found between cropland and homestead agroforestry based on gender. Men are involved in agroforestry on croplands, while women are involved with agroforestry in lands immediately adjacent to their homesteads. Women do not usually go to work in the croplands that are distant from their houses. Male members of the family make decisions related to agroforestry with suggestions from their wives. A difference was also noted on obtaining agricultural training as expressed by one participant of Belabo:

*In most the cases men are getting the training. Women are given the training for vegetable production in homestead. Men are given training for cropland agriculture.*

## 8. Discussion and conclusion

In this research, we explored social and cultural aspects of an established agroforestry system. Our historical review indicates changes that communities experienced from the distant past to the present. People have adapted to growing different crops and species in different time periods according to their needs and available resources, while also shifting towards more cash crops. Changes have been accelerated by population increases, road development, electric irrigation equipment, market facilities and other factors. Jackfruit has continued to be the main tall tree component, while the understory components have changed over time.

Burmese grape has been a significant addition in the recent history of agroforestry practices within the study communities. It is apparent that farmers have accepted the jackfruit-Burmese grape based system so widely that it has become the dominant agroforestry system in these communities. Though they are facing some problems related to the system, they feel encouraged to maintain this system because of the obvious benefits and low resource requirements. Their interest in the jackfruit – Burmese grape system reflects compatibility of the system with their resources, the condition of their lives, and current agroforestry practices.

Fieldwork confirms that most of the socio-cultural dimensions reviewed in the analytical framework are relevant for cropland agroforestry in the study communities (i.e. relationship with agricultural environment, traditional knowledge and practices, linkages with friends and families and gender), while a few have been found to be irrelevant in this case (i.e. religion). In addition to the reviewed dimensions, some new

dimensions have been revealed through the fieldwork (i.e. traditional beliefs and practices). Fieldwork also revealed that some dimensions are particularly important for agroforestry in the homestead but not in croplands (e.g. religion and traditional belief), which can be explained by the fact that homestead agroforestry contributes to fulfilling household personal consumption while cropland agroforestry is focused more on cash crop production. The results presented here show that local values, norms and practices are deeply linked with agroforestry in this area. This outcome suggests that an analysis of social and cultural dimensions of agroforestry is not a single dimension of analysis but rather a set of inter-relating dimensions. These norms and values are summarized in Table 1.

**Table 1.** Socio-cultural dimensions related to cropland agroforestry

Dimensions	Norms and values
Relationship with agricultural environment	<ul style="list-style-type: none"> <li>• Appreciation of life as a farmer</li> <li>• Self-reliance</li> </ul>
Traditional practices and knowledge	<ul style="list-style-type: none"> <li>• Reliance on ancestral customs</li> <li>• Dependence on available resources to grow species</li> <li>• Dependence on local species</li> </ul>
Community linkages	<ul style="list-style-type: none"> <li>• Share and exchange of local planting materials</li> <li>• Trust and follow local sources (fellow farmers, friends and relatives)</li> </ul>
Cultural traditions	<ul style="list-style-type: none"> <li>• Cultural celebrations related to fruit harvesting season (inviting and sending fruits to relatives or friends, making traditional cakes)</li> <li>• Punishment for selling stolen seasonal fruits</li> <li>• Donation to local social welfare institutions</li> </ul>
Gender	<ul style="list-style-type: none"> <li>• Difference between men and women participation in cropland</li> </ul>

In light of the link between culture and agroforestry in this study, some critical issues can be considered in the design of new agroforestry systems within the region. These considerations are discussed in terms of (1) resource capability of local farmers, (2) appreciation of local socio-cultural perspectives, and (3) importance of established agroforestry systems particularly within the homestead area.

It is apparent that the capability of the farmers to manage resources to support agroforestry practices is a critical issue. Land, water, cash and labor are the required resources for their practices. Considering these resources, in the croplands, farmers grow species that (a) require less water as water drains more readily from these areas, (b) require less labor and less care so that they can be involved in other social and economic activities, and (c) do not need a big amount of cash in buying inputs such as labor, fertilizer and planting materials. Since the majority of farmers in the communities (about 80%) are small-scale farmers, most cannot reap benefits from a project if the project is not designed to suit their abilities and resource capacities. If the goal of poverty alleviation is to be achieved, any project intervention will need to give special attention to these issues.

Another issue is to understand the importance of cultural traits embedded with the existing systems. These traits help to sustain the current agroforestry system, nurturing trust and local cooperation between farmers. Innovations in agroforestry can build on utilizing this system of local sharing and exchange. For example, in the design of new agroforestry interventions, building on local traditions of seed sharing by local farmers, rather the seed vendors that are not known to farmers may be a more compatible with local farming traditions.

A final issue relates to the existing agroforestry system. As described in the historical overview section of this paper, farmers have spontaneously developed a jackfruit-Burmese grape system and this system has evolved locally through trial and error. The system is already widely distributed, is highly productive, and can support existing and important cultural characteristics within the communities. Reflecting on the words of Ancleti (2002, pp. 170) "the tendency has been towards finding alternatives to what people already have, rather than identifying where the inadequacies lie and improving on them." We also found this to be the case, where farmers may have better access to agricultural extension officers but the focus of these officers is often on new crops and new interventions. This study suggests careful attention to the existing agroforestry system, to understand the ongoing opportunities and challenges of this system. Farmers are facing ongoing challenges regarding improved Burmese grape production and they expressed their needs about information and training on male-female tree composition and vegetative propagation, which require particular attention. Toward this end, insights from this research are helpful for policy-makers and practitioners as well as communities in determining priorities for future agroforestry development projects in these villages.

## Acknowledgement

The authors would like to thank World Agroforestry Centre for providing the research grant for fieldwork in Bangladesh and Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) for providing logistical support during the fieldwork.

## References

- Ahmed, Y. (1993), "Women in Agroforestry", In Mahat, T. B. S. (Ed.), *Agroforestry Training Course Module for Bangladesh, Training Support Series-2*, BARC-Winrock International, Agroforestry and Participatory Forestry Research & Training Support Program, Dhaka, pp. 172-178.
- Alam, M. K. (1993), "Agroforestry Research Needs in Bangladesh", In Mahat T. B. S. (Ed.), *Agroforestry Training Course Module for Bangladesh, Training Support Series-2*, BARC-Winrock International, Agroforestry and Participatory Forestry Research & Training Support Program, Dhaka, pp. 155-160.
- Alam, M. and Sarkar, S. K. (2011), "Homestead Agroforestry in Bangladesh: Dynamics of Stand Structure and Biodiversity", *Journal of Sustainable Forestry*, Vol. 36 No. 6, pp. 584-599.
- Anacleiti, O. (2002), "Research into local culture: Implications for Participatory Development", in Deborah, E. (Ed.), *Development and culture: Selected essays from Development in Practice*, Oxfam GB, Oxford, pp. 168-173.
- Akter, M. A., Miah, M. G., Hossain, S. T., Fatema, M. and Mahmudunnabi, M. (2010), "Indigenous medicinal plant species and their relative prevalence in homestead and crop field at north-west region of Bangladesh", *Eco-friendly Agricultural Journal*, Vol. 3 No. 8, pp. 349-357.
- Atangana, A., Khasa, D., Chang, S. and Degrande, A. (2014), "Socio-Cultural Aspects of Agroforestry and Adoption", In *Tropical Agroforestry*, Springer Netherlands, pp. 323-332.
- Bangladesh Bureau of Statistics BBS (2007a), *Bangladesh Population Census 2001, Community Series, Zilla: Narsingdi*, Ministry of Planning, Dhaka.
- Bangladesh Bureau of Statistics BBS (2007b), *Bangladesh Population Census 2001, Zilla Series, Zilla: Narsingdi*, Ministry of Planning, Dhaka.
- Bardhan, S., Jose, S., Biswas, S., Kabir, K. and Rogers, W. (2012), "Homegarden agroforestry systems: an intermediary for biodiversity conservation in Bangladesh", *Agroforestry Systems*. Vol. 85 No. 1, pp. 29-34.
- Barua, B. P. (2010), "Development Intervention and Ethnic Communities in Bangladesh and Thailand: A Critique", *Journal of Alternative Perspectives in the Social Sciences*, Vol. 2 No. 1, pp. 372-400.
- Baxter, J. and Eyles, J. (1997), "Evaluating Qualitative Research in Social Geography: Establishing 'Rigour' in Interview Analysis", *Transactions of the Institute of British Geography*, Vol. 22 No. 4, pp. 505-525.
- Burdge, R. J. and Johnson, S. (1994), "Sociocultural Aspects of the Effects of Resource Developments", In Burge, R. J. (Ed.), *A Conceptual Approach to Social Impact Assessment*, Social Ecology Press, Wisconsin, pp. 25-40.
- Cernea, M. M. (1990), "Using knowledge from Social Science in Development Projects", *World Bank Discussion Papers*, Vol. 1 No. 114, The World Bank, Washington, D.C.
- Canadian International Development Agency CIDA (1995), "Involving culture: A fieldworker's guide to culturally sensitive development", available at: <http://unesdoc.unesco.org/images/0012/001204/120456eo.pdf> (accessed August 5, 2011).



- FAO (2010). Global Forest Resources Assessment 2010, Main Report. FAO Forestry Paper 163. Food and Agriculture Organization of the United Nations: Rome.
- Finsterbusch, K. (1995), "In Praise of SIA – A Personal Review of the Field of Social Impact Assessment: Feasibility, Justification, History, Methods, Issues", *Impact Assessment*, Vol. 13 No. 3, pp. 229-252.
- Gadgil, M. and Vartak, V. D. (1975), "Sacred groves of India: A Plea for Continued Conservation", *Journal of Bombay Natural History Society*, Vol. 72, pp. 314-320.
- Haque, M. F. (1993), "Effect of Forest Resource Depletion on Environment". In Mahat T. B. S. (Ed.), *Agroforestry Training Course Module for Bangladesh, Training Support Series-2*, BARC-Winrock International, Agroforestry and Participatory Forestry Research & Training Support Program, Dhaka, pp. 10-17.
- Hocking, D. and Islam, K. (1994), "Trees in Bangladesh Paddy Fields and Homesteads: Participatory Action Research Towards a Model Design, *Agroforestry Systems*, Vol. 25, pp. 193-216.
- Hoskins, M. W. (1987), "Agroforestry and the Social Milieu", In Steppeler, H. A. and Nair, P. K. R. (Eds.), *Agroforestry a Decade of Development*, International Council for Research in Agroforestry, Kenya, pp. 191-203.
- Ingles, A. W. (1997), "The influence of Religious Beliefs and Rituals on Forest Conservation in Nepal", In Zeeland, K. (Ed.), *Nature is Culture: Indigenous Knowledge and Socio-cultural Aspects of Trees and Forests in non-European cultures*, Intermediate Technology Publications Ltd, UK, pp. 57-66.
- Interorganizational Committee on Guidelines and Principles for Social Impact Assessment ICGP (1995), "Guidelines and Principles for Social Impact Assessment", *Environmental Impact Assessment Review*, Vol. 15 No. 1, pp. 11-43.
- Jena, M. K., Seeland, K. and Patnaik, K. K. (1997) "Where Trees Do Matter for Society: the Socio-cultural Aspects of Sal (*Shorea Robusta*) and Salap (*Caryota urens L.*) in the Similipal Hills of Orissa, India", In Seeland, K. (Ed.), *Nature is Culture: Indigenous Knowledge and Socio-cultural Aspects of Trees and Forests in non-European Cultures*, Intermediate Technology Publications Ltd, UK, pp. 79-89.
- King T. F. (1998), "How the Archaeologists Stole Culture: A gap in American Environmental Impact Assessment and how to fill it", *Environmental Impact Assessment Review*, Vol. 18 No. 2, pp. 117-34.
- King, T. F. (2000), "What Should be the "Cultural Resources' Element of an EIA?", *Environmental Impact Assessment Review*, Vol. 20, pp. 5-30.
- Lai, C. K. (1991), "Design of Agroforestry Systems: Some Examples and Lessons from Bangladesh", *Forest Ecology and Management*, Vol. 45, pp. 193-198.
- Maag, B. (1997), "Forests and trees in the world of two Tamang villages in Central Nepal: observations with special reference to the role of Tamang women in forest management", In Seeland, K. (Ed.), *Nature is Culture: Indigenous Knowledge and Socio-cultural Aspects of Trees and Forests in non-European Cultures*, Intermediate Technology Publications Ltd, UK, pp. 113-129.
- Mallick, D. (2000), "Investigating Indigenous Knowledge: Review of the Bangladeshi Literature on Natural Resources", In Sillitoe, P. (Ed.), *Indigenous Knowledge Development in Bangladesh*, Intermediate Technology Publications Limited, UK, pp. 41-54.

- Mercer, D. E. and Miller, R. P. (1998), « Socioeconomic Research in Agroforestry: Progress, Prospects, Priorities », *Agroforestry Systems*, Vol. 38, pp. 177-193.
- Meinzen-Dick, R. and Adato, M. (2007), "Impacts of Agricultural Research on Poverty: Synthesis of Findings and Implications for Future Directions", In Adato, M. and Meinzen-Dick (Eds.), *Agricultural Research, Livelihoods, and Poverty: Studies of Economic and Social Impacts in Six Countries*, The John Hopkins University Press, Baltimore, pp. 331-367.
- Merino, S. S. and de los Ríos Carmenado, I. (2012). "Capacity building in development projects", *Procedia-Social and Behavioral Sciences*, Vol. 46, pp. 960-967.
- Miah, M. G., Ahmed, F. U., Ahmed, M. M., Alam, M. N., Choudhury, N. H. and Hamid, M. A. (2002), *Agroforestry in Bangladesh: Potentials and Opportunities*, Paper presented in South Asia Regional Agroforestry Consultation workshop held on 23-25 November, 2002 at New Delhi, India.
- Miah, M. G. and Hussain, M. J. (2010), "Homestead agroforestry: a potential resource in Bangladesh" In *Sociology, Organic Farming, Climate Change and Soil Science*, Springer, Netherlands, pp. 437-463.
- Miah, M. D. and Rahman, M. M. (2004), "The Effect of Religious Sub-Culture on the Stock and Diversity of the Village Forests in the Floodplain Area of Bangladesh" In Baumgartner, D. M. (Ed.), *Proceedings of Human Dimensions of Family, Farm, and Community Forestry International Symposium*, Washington State University, Washinton, pp. 89-94.
- Miah, M. G. (2011), *Improvement of Agroforestry Practices for Better Livelihood and Environment: BSMRAU Component - Inception Report*, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur.
- Muller, E. U. and Scherr, S. J. (1990), "Planning Technical Interventions in Agroforestry Projects", *Agroforestry Systems*, Vol. 11, pp. 23-44.
- Nair, P. K. R. (1989), "Agroforestry Defined", In Nair, P. K. R. (Ed.), *Agroforestry Systems in the Tropics*, Kluwer Academic Publishers, Netherlands, pp. 13-18.
- Pal, T. (2011), "Geographical Assessment of Sacred Groves in Bolpur Sub-division, India", *Ethiopian Journal of Environmental Studies and Management*, Vol. 4 No. 2, pp. 52-60.
- Puri, S. and Nair, P. K. R. (2004), "Agroforestry Research for Development in India: 25 Years of Experiences of a National Program", *Agroforestry Systems*, Vol. 61, pp. 437-452.
- Rahman, S. A., Groot, W.T. D. and Snelder, D.J. (2008), "Exploring the Agroforestry Adoption Gap: Financial and Socioeconomics of Litchi-Based Agroforestry by Smallholders in Rajshahi (Bangladesh)", In Snelder, D. J. and Lasco, R. D. (Eds.), *Smallholder Tree Growing for Rural Development and Environmental Services*, Springer Science + Business Media B.V, pp. 227-243.
- Rahman, S. A., Paras, F. D., Khan, S. R., Imtiaj, A., Farhana, K. M., Toy, M. M., Akhand, M. B. and Sunderland, T. C. H (2011), "Initiatives of Tropical Agroforestry to Sustainable Agriculture: A case study of Capasia Village, Northern Bangladesh", *Journal of Horticulture and Forestry*, Vol. 3 No. 4, pp. 115-121.
- Rashid, H. (2006), "Madhupur Tract". In Islam, S. (Ed.), *Banglapedia: National Encyclopedia of Bangladesh*. Asiatic Society of Bangladesh, Dhaka.

- Rule, L. C., Flora, C. B. and Hodge, S. S. (2000), "Social Dimensions of Agroforestry", In Garrett, H. E. *et al.* (Eds.), *North American Agroforestry: An Integrated Science and Practice*, American Society of Agroforestry, WI, pp. 361-386.
- Sarkar, M. M. H. (2006), "Narsingdi District". In Islam, S. (Ed.), *Banglapedia: National Encyclopedia of Bangladesh*. Asiatic Society of Bangladesh, Dhaka.
- Satterfield, T., Gregory, R., Klain, S., Roberts, M and Chan, K. M. (2013), "Culture, intangibles and metrics in environmental management", *Journal of Environmental Management*, Vol 117, pp. 103-114.
- Singh, A. K. (2010), "Probable agricultural biodiversity heritage sites in India: VI. The northeastern hills of Nagaland, Manipur, Mizoram, and Tripura", *Asian Agri-History*, Vol. 14 No. 3, pp. 217-243.
- Soil Resource Development Institute SRDI (1991), *Upazila Land and Soil Resource Utilization Guide, Belabo Upazila*, Government of Bangladesh, Dhaka.
- Soil Resource Development Institute SRDI (2003). *Upazila Land and Soil Resource Utilization Guide, Shibpur Upazila*. Government of Bangladesh, Dhaka.
- Spaling, H., Montes, J. and Sinclair, J. (2011), "Best practices for promoting participation and learning for sustainability: lessons from community-based environmental assessment in Kenya and Tanzania", *Journal of Environmental Assessment Policy and Management*, Vol. 13 No. 3, pp. 343-366.
- Szymanski, M. and Colletti, J. (1999), "Combining the Socio-economic-cultural Implications of Community Owned Agroforestry: The Winnebago Tribe of Nebraska", *Agroforestry Systems*, Vol. 44, pp. 227-239.
- Trefry, A., Parkins, J. R. and Cundill, G. (2014), "Culture and food security: a case study of homestead food production in South Africa", *Food Security*, Vol. 6 No. 4, pp. 555-565.
- Vanclay, F. (2002), "Conceptualizing social impacts", *Environmental Impact Assessment Review*, Vol. 22, pp. 183-211.
- Van Schooten, M., Vanclay, F. and Slootweg, R. (2003), "Conceptualizing Social Change Processes and Social Impacts", In Becker, H. A., and Vanclay, F. (Eds.), *The International Handbook of Social Impact Assessment: Conceptual and Methodological Advances*, Edward Elgar Publishing Limited, UK, pp. 74-91.
- Verhelst, T. and Tyndale, W. (2002), "Cultures, Spirituality, and Development", In Eade, D. (Ed.), *Development and culture: Selected essays from Development in Practice*, Oxfam GB, Oxford, pp. 1-24.
- World Bank (2015). Data: Rural Population. (<http://data.worldbank.org/indicator/SP.RUR.TOTL>, accessed 4 August 2015).