

Assessment of Socio-Economic Role of *Yushania alpina* in Dawuro Zone, Essera District, SNNPR, Ethiopia

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ABSTRACT

Bamboo (*Yushania alpina*) known as highland bamboo is a perennial, multipurpose and fast-growing plant that supports local livelihoods in many ways. However, for long its uses have been limited to traditional applications. Although bamboo has quit high distribution and widely utilized by a large number of local communities in Ethiopia, little baseline information on its livelihood support and domestication status exist for several areas. The objectives of this study were to assess the socio-economic roles of *Yushania alpina* in the Essera district, Zadi Shamity kebele of Dawuro Zone, SNNP Region. The study used a combination of methods to achieve the set objectives. The socio-economic survey involved formal and informal interviews and observations. On the farm, the bamboo stock was assessed using farm-level inventory. For socio-economic data collection, a formal (questionnaire) survey was administered on 60 respondents. The respondents were selected from one peasant kebele; this kebele was purposefully selected among the 29 kebeles within the district. This selection was based principally on accessibility and abundance of bamboo resources, use and marketing history. The results showed that the aggregated contribution of bamboo to the gross household income is found to be only 11% of the total, which is very less than the income from agriculture (30%). The income generated from bamboo ranks second in importance as sources of household income. Bamboo is used for a variety of traditional applications include construction, fencing, fodder, household furniture, fuel-wood and as a cash source. Almost 96% of households have been started bamboo cultivation on their land and wasteland. Among these, almost above the average respondents (71%) of the respondents) had inherited their bamboo stands from parents. The major push factors for cultivation/domestication in their order of importance are increasing bamboo use for different household purposes, income generation and depletion of bamboo in the natural stand. In conclusion, promotion, training and market facilitation for better economic incentives from bamboo may win increased local people participation bamboo cultivation, which may ultimately lead to better conservation and utilization of bamboo.

Keywords: *Yushania alpina* • Socio-economic • Household use • Income generation • Essera

Introduction

Background

N.T.F.Ps are not only crucial to ecosystem but valuable to the live hood of communities NTFPs are known to general substitution, to generate foreign exchange and are increasingly being regarded as valuable communities

around in the world, our perception and evaluation of NTFPS are changing due to an alarming rates of deforestation and decrease the yield of NTFPS and income from them Kigomo [1].

Bamboo is one of the NTFPs, and is one of the world's greatest renewable natural resources, which yields a multitude of products and services of high economic value to humankind; besides, it also plays a vital role in conserving ecological stability and biodiversity. Bamboos are tall perennial, arborescent grasses, belonging to the sub-family Bambusoideae of the family *Poaceae*. Almost 75 genera and more than 1500 species of bamboo and still more with incorrect names are found in the world [2].

The morphology of bamboo belongs to the tribe of bamboo belongs to the trivet CF bamboo so the idea of the plant family of *Poaceae* which called giant grass. It is the most relatively fast-growing species attaining stand maturity with five to seven years and the infrequently flowering of 15-40 years then dies [1,3].

The set of pure bamboo forests in Ethiopia is the largest in Africa; it covers more than one million hectares and makes up 67% of the total bamboo resources in Africa, and more than 7% of the world total [4]. The two recorded natural species of bamboo which grow in Ethiopia are *Yushania alpina* Known as Highland bamboo and *Oxytenanthera abyssinica* (A. Rich) Munro known as Lowland bamboo [4,5]. Bamboos are the most freely and readily available resources for the communities living within and around the natural bamboo forests of Ethiopia [5].

However, despite the availability of the resource in large quantities and at low cost, its uses have been limited to traditional applications such as hut construction, fencing, and to a lesser extent, the production of handicrafts, furniture, containers for water transport and storage, baskets, walking sticks, agricultural tools, beehives, household utensils and various other artifacts [5]. Even with regards to its low-level traditional applications, there is still little baseline information on the situation of bamboo as a source of livelihood [6]. Bamboo, like other NTFPs, receives little attention [5,6]. However, there is little research and information on the extent of bamboo domestication, on the management of the domestic stocks and on its role in household livelihoods in Ethiopia.

The habitat distribution is largely governed by rainfall, temperature, altitude, and soil. The most bamboos require a temperature of 8°C-36°C of a minimum of 1000 mm annual RF high atmospheric humidity for good growth and development. They mostly grow or exist in most valleys, sheltered depression along the stream and lower hill slopes but occasionally occur in higher slopes and hill slopes usually mixed with or under tree species in open canopy [5].

In Ethiopia, only species of bamboo are growing and both are endemic to Africa [5]. These species are *Yushania alpina* K. Schum (high land bamboo)

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and *Oxytenanthera abyssinica* Aiorichmuaro or lowland bamboo. In Ethiopia, it has covered one million hectares of *Yushania alpina*. and low land bamboo resources which cover about 68% of the African bamboo coverage and more than 7% of the world total coverage of bamboo resource [4].

Yushania alpina is only high land bamboo which synonyms to Arudinaria, found in the high land of Ethiopia which distributed in south and southwestern part mainly Mesha, reach Bonga, Tilikum, and Tinishu Gesha forest, Hagereselam, Bore, Jima, on Bale mountain b/n 2400 to 3600 m.a.s.l. at Jibat mountain.

Statements of the problem

The district high rate of population growth due to these subsequent demands of crop grazing land construction material, fuelwood demand charcoal demand, low agricultural productivity, low standing of living lack income and income source or no alternative income source. These all caused due to lack of appropriate land use system no recommended forest police regulation. These constraints induce high migration of productive age to town or city, border conflicts, lack of water, or clean water lack of children education, health care problem malnutrition and starvation.

In the district, many communities use highland bamboo extensively to use building material and use a diversity of traditional housing design. However, modernization of the decreasing availability of bamboo resources increased the rural population, due to the conversation of bamboo to other crops and lack of adequate processing skill trend operation management skills. There is a global demand for bamboo a wood substitute for several constructions and furnishing applications.

Bamboo resources are often poorly managed and high conversation of the area to other crop products due to low awareness of bamboo management, advantage. Socio-economic role of their advantage and uses farming system other constraints face rural community. The current study will socio-economic role *Yushania alpina* in the study area.

Objective

General objective

To assess the socio-economic roles of *Yushania alpina* in Dawuro zone Essera district, Zadi Shamity kebele.

Specific objective

- 1 To compare the different sources of income in a rural community with bamboo *Yushania alpina* income
- 2 To explore the economic role of highland bamboo *Yushania alpina*
- 3 To assess the social role of *Yushania alpina*

Literature Review

Bamboo is fast growth and high yielding perennial plant with considerable potential socio-economic development and environmental protection. It is multipurpose NTFPs that provide several uses from handicrafts to medicine [1]. It also regarded as the green gold of 21st century and commonly as a poor many timber in India and China and plays as significant roles in human society since time imperials and today contributes to the subsistence need to over billion of peoples in worldwide and play vital roles in the socioeconomics of the rural communities [7].

The morphology of bamboo beings to the tribe of bamboo side of the plant family of *Poaceae* which called giant giraffes it is the most relative fast-growing species affiancing stand maturity with five to seven (5-7) years and them in the queenly flowering of 15-40 years then die out [1,3].

As many as 1500 species and above and the 75 general which cover 14 million hectors (ha) area of bamboo exist worldwide. Most of which grow south Eastasia, they distributed mostly in the tropical but occur naturally in sub-tropical temperature zone 0f content except Europe of the latitude of 46 North, the longitude of 47° C South [1,2,8].

In Africa, small cover to compare Asia which is 1.5 million hectors has predominantly distributed the Easter part of Africa among 45 species and 14 genera pheasant from 40 species in and 3 species is in East African mainland [8] of which 2 species found in Ethiopia [6].

According to Lobovikov [9], over 1500 distinct uses of bamboo have been recorded in the world. The number is growing rapidly with new development initiatives. A huge range of bamboo products that are excellent substitutes for timber-produced materials has also been innovated.

Based on the current bamboo industrial uses and the technical availability in the world, the commercial usages of bamboo resources at an industrial scale are categorized in the following serial of products: 1) bamboo flooring and furniture, 2) bamboo plywood for truck carriage and bamboo molding board for concrete, 3) bamboo charcoal and its side-product-bamboo acetum/vinegar, 4) Bamboo pulping and paper, 5) Edible bamboo shoots, 6) bamboo fiber and textile, 7) bamboo chemical utilization. Bamboo pipe-lines (length of more than 150 km) in Tanzania [8], bamboo housing in Costa Rica and other parts of Latin America, mat boards in India, composite panels such as Oriented Strand Board (OSB) particleboard, fiberboard, and laminated bamboo composite in various countries [9] are also worth mentioning. The eco-tourism value of bamboo is also high. The total annual world export of bamboo and rattan is 5 billion USD as compared to 8 billion USD for tropical timber, 10.2 billion USD for coffee, 6.4 billion USD for hides and skin [10].

Bamboo has been traditionally used as, fuel, food for rural housing shelter, fencing, tools, and various other purposes and in modern being used as industrial, raw materials for pulp, paper, construction and engineering materials product etc also a present-day industry uses bamboo for a more modern product such as baskets, vessels, pencil, and pen holder, kitchen container wall plagues table mat lump shade, medicine charcoal, etc all of which are decorative cumulative value and cash income, furniture and handcraft also bee hive constriction and restaurant for beauty. It was almost replacing wood in many industrial applications and thereby saving and restoring the forest. It is also a major construction material in many countries of rural areas as used for almost all parts of house including post, roofs, wall, floor beams, trusses, and fencing peoples also use bamboo to produce mats basket, hats, musical instrument/xyphore/and furniture as well as in the food sector where bamboo shoots are delicious [3].

Unlike other countries, bamboo utilization in Ethiopia has been customary and mainly limited to hut construction, fencing and a lesser extent production of handicrafts, furniture, containers for water transport, and storage, baskets, beehive, firewood, fodder, house utensils, various art-facts, and walking sticks [5]. Although some people (particularly in Benshangul Gumuz National Regional State) use bamboo shoots in their diet, there are no data available to quantify the exact amount used and the way of processing in this regard [3]. Despite the multiple uses of bamboo in industrial applications, up to now, Ethiopia is not getting the most economic advantage out of it. The utilization is fully for domestic use. The low level of its utilization among others entails the lack/absence of processing technologies and technologies to protect bamboo products from biological and physical damages. Accordingly, it has got fewer acceptances by both potential investors and growers [3]. The potential of bamboo in substituting industrial wood, hence it's potential to narrow the gap between the demand and supply is not recognized yet.

Bamboo uses as construction

Bamboo is highly used as a substitute timber (wood) in South East Asia and well as in worldwide including Ethiopia. It is lightweight height module elasticity, durable straight which like to natural climates such as earthquake, hurricanes and tensile strength of bamboo greater than the steel and iron.

However, for all these advantageous properties, bamboo is used for many construction purposes [4,5],

In worldwide all rural house has been constructed from Culm/stem/of bamboo including Chinese house. The fence, post, roof, walls, floor beams, trusses and another part of the house. It used to produce, mat, baskets tools handles of agricultural tools, music instrument, and house furniture such, as table, chairs, containers, pencil and pen holder on modern industries and also traditionally house with which from building that function as a home ranging from sill dwelling such as rudimentary huts of also medial tribes and the improvised to complex. Fixed structures of the wood bridge, Marble or other materials containing pumping, ventilation. Electrical system, bedroom, bathroom, kitchen/cooking room/area and living room for agriculturally oriented society, domestic animal room such as chicken, room. Largest animals like cattle, equines may share part of the house with humans, constructed by bamboo *Y. alpine* and also the social unity that lives in a house is known as household, children and other rooms divided by bamboo.

Through new technology, bamboo has been combined with modern material like reinforced concrete including housing, bridges, and observation towers.

These architecture have made a deliberate attempt to increase, social acceptance of bamboo and promote its adaption as an inexpensive and environmentally friendly building material among both rich and poor.

Bamboo uses as charcoal and fuel woody

Dried parts/culms/and other part *Yushania alpina* was used by rural people as fuelwood and the charcoal through their calorific value is not high and bamboo charcoal purifies the air, releasing negative ions which calm the mind and spirit and remove the bad smell and it also perfects skin which adsorbs excess moisture from air and skin in good condition, The fuel of bamboo substitutes the other wood and reduces the deforestation of natural forest and other tree species cutting for domestic use [5].

Bamboo uses as animal forage

The leaves of several bamboo species are used as fodder for ruminants due to their high digestible nutritional and palatable in wood wide and bamboo as animal feed since it is drought resistance and every green plant throughout the dry season providing green forage to ruminants [11].

Bamboo use as food

The tender shoot same bamboo species are not only edible and succulent best a good nutritious that they contain and many uses which confirmed in many Asia countries such as China, Japan, Taiwan, Thai lands, Philippines, Indonesia, Nepal and India, and other world due to the following nutritional values and properties of bamboo shoot, such as low caloric content, low sugar content, low amounts of fats, source of protein, containing vitamin and mineral (vitamins such as vitamin A, vitamin B, vitamin E, thiamin riboflavin, niacin foliate and pant other acid. Minerals found in bamboo shoots include calcium, magnesium, phosphorous, manganese's, potassium, sodium, zinc, copper, selenium and Iron, the shoot can give high value in dietary fiber [12-14].

Bamboo uses as medicine

The white siliceous, serration known as bonuses Chan is from the rillolo in ternade of some the bamboo species. It is used as according to fonic and aphrodisiac and in astrmacoush and other blebilitcing disease and the sap of beiledacooring fender shoot of bamboo center as hydrocyclic acid and possesses, ants and septic and tauricidebal properties.

Bamboo high supply of dietary fibers, which lose weight, anti in mammary properties (painkilling used to medicine for external wound and ulcers treats Respiratory disorders, a possible cure for poisoning is used for a delivery

date for pregnancy, have uterotonic properties, remedy for intestinal worms and stomach disorder.

Material and Methodology

Description of study area

The Douro is a zone in the Ethiopia south Nation Nationalities and peoples Regions state/SNNPR/. It located at about 497 km in the south west of Addis Ababa, the capital of Ethiopia and 280 km to Hawassa, the regional capital SNNPR 140 km of South East of Jima city, 177 km west to Woilata Sodo city. It is 714 North latitude, and 35 S, east of longitude. The administrative center or capital town of Dawuro is Tarcha. Dawuro besided on the north by Gojeb river which defines boundary with Oromia Regions on the northeast by Hadiya and KambataTembaro on the east by Wolaita. The Omo river (Gibe III) hydroelectric plant project defines its eastern and southern boundaries on the south by Gamo-Gofa, and on the west by konta special woreda (district).

Demographics of the zone

Based on the 2007 census conducted by the central statistical Ages of Ethiopia (CSA) the zone has a total population of 489,577 of whom 249,763 a ramen and 240,314 women which area of 4,814,575 square kilometers. And a total of 89,915 Household were accounted in Dawuro, the ethnic group larges are Dawuro, and Hadiya. Dawurto is spoken language in ethnic group Hadiya, Kambata, Tembaro, some of Afan-Oromo origin regions bonders the protestant, Ethiopian orthodox Christianity, traditional, and some of Blanc, like disnhemet of Loma district of dawuro (ESA, 2007) and The zone composed five district Maraka, Tocha, Essera, Gena-Bossa, Loma.

Essera woreda is one of 5 woredas Dawuro zone in, located 81 km on south of Tocha, capital of Dawuro zone, The demographic of the woreda total population of 86.136 of whom 43092 male and 43044 female, with the area 1043 km²/110,018 ha/among the total 33,035 ha productive/cultivate, 38,506.35 ha forest shrub which include the bamboo plants. The ecology of the woreda includes KAB, half and b/n high land/weinadega and dege/. The crop cultivated which includes Enset, tuber, root/yam/and other for domestic use Enset rots drought resistance crop and poverty alleviation crop to the woreda, other are highly cultivated such sorghum, maize, wheat, Barley, Teff, coffee and Haricot bean as a cash crop. In some part bean, peas, sesame of low land and other predictive in the woreda, the Animal product on special Cattle, Sheep, Goat, equines Except camel all produce, and pantry and Apiculture area sties production. Dawuro"oyasa" or butter special known and wildlife conservation the district sharing Chabara, Churchura national park with konta special worada [12].

Zadi Shamity kebele was selected from the 29 rural kabele of the woreda. Based on the high potential and coverage of bamboo *Yushania alpina*. Total area coverage of the study kebele is 1008.125 Ha. This kebele is bounded by in Eastern part Mansa River, in Western side Zadi words kebele, in Northern side Bale kebele, and Southern side Hageli 02 kebele. The average altitude of zadi shamayti kebele is 2100 m above sea level. In terms of agroecology, 75% of the study is dega and 25% weyna dega.

Methodology

Sampling method and sample size: The sampling method and size of this study were on the way how to come up with relevant data concerning the topic in Dawuro Zone, Essera woreda Zadi Shamiti kebele. This kebele was selected purposefully from 29 rural kebele due to the high pintail of bamboo resource and area coverage of the *Yushania alpina*. The total population of the kebele 2984 of whom male 1488, female 1496 and among the total population 564 Households of 464 male and 77 female (women). The investigation was undergone by selecting 10% of from total Household (HH)

whom 60 respondents 50 men and 10 women based on the wealth category and bamboo potential (rich, medium, poor) by stratified statistics method.

Data collection method: The data for this study was generated from both secondary and primary sources of data focusing on both qualitative and quantitative natures.

a. Secondary sources: The secondary sources of information including, research journals and articles, internet sources, different agriculture and rural development office reports, and document reviewed at different levels of government organizations were used.

b. Primary sources: the primary sources of the thematic issues were focused on sample farmers in Zadi Shamity Kebele of the Essera district. To collect reliable data, the field study combined Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and Household Surveys and Direct Observations.

Data analyzing method: After data have been collected, it was analyzed by using table simple, regression, standard deviation, range, simple statistics such as mean, percentage and mode were used.

Results and Discussion

Demographic and socio-economic characteristics of respondent farmers

The demographic and socio-comic characteristics of the respondents' farmers in the study area are sex, age, marital status, family size, education level, and religion (Table 1).

Table 1. Demographic and socio-economic characteristics of respondent farmers.

Variables	Frequency	Percent
Sex structure of HH		
Male	50	83.33
Female	10	16.67
Religion of HH		
Protestant	39	66
Orthodox	21	34
Education of HH		
Illiterate	11	18.33
Can read and write	49	81.67
Age of HH		
30-40	4	6.67
40-50	28	46.66
50-60	23	38.34
Above 60	5	8.33

Source: Own survey, (2018)

There are 29 kebeles in Essera district. The research data were collected from Zadi Shamaity kebele only. The sample size obtained from this kebele

was 60 by a simple random sampling technique. From the table above respondents who were volunteers to give the required information among which 50 were males and 10 were females from Zadi Shamaity kebele.

Marital status of the respondents

The marital status of the respondents is that almost all respondents were interviewed married. Among the respondent, I didn't come up with unmarried widowed or divorced, unfortunately. A man who has lost his wife by death can marry an extra wife and a woman who has lost her husband can marry anyone else.

The religion of the respondents

As far as concerned with the religious people in the study area different have religion and beliefs. From the interviewed respondents 71.7 percents are the followers of the protestant religion and the rest 28.3 percents are the followers of the orthodox religions respectively.

Age grade of respondents

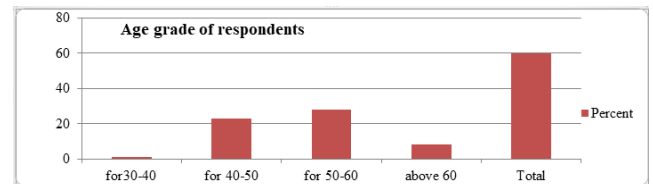


Figure 1. Age grade of respondents.

Education levels of the respondents about 38.3 percents are those who cannot read and write and sign their signature by their finger and the rest 61.7 percent literate who have learned from the grade four and above. However majority of respondents can read and write. They could not know the exact date of birth (Figure 1).

Table 2. Source of cash income for the respondents.

Major Sources of Income	Frequency	Percent
Agriculture	30	50
Bamboo products	11	18.34
Livestock production	10	16.66
Honey	4	6.66
Sale of firewood	2	3.33
Governmental worker	2	3.33
Charcoal	1	1.66
Total	60	100

Source: Field survey, 2018

Age of respondents

The age of the respondents was 30 up to 60 and above, but the age of the respondents more their ages since they tell the assumption or estimate about their age. Dominated were 40 up to 60 and above as can see on the bar graph. From those respondents the majority of their age accounts, 40-50 and 50-60 are 38.3% and 46.7% from the 60 respondents' respectively. This is because those people under the age below 30 do not have awareness of the benefit

of forest production and protection, so age significantly affects participation in forest production and protection.

Livelihood strategies of respondents

All (100%) of the respondents had more than one source of income (Table 2). Households in the study area were engaged in a variety of farm and off-farm activities. However, the major income sources for the households were agriculture (crops, vegetables, and livestock), bamboo production and production of other tree products (pole and fuel-wood). Other limited sources of income were wage-labor, petty trading, and beekeeping. As the table above indicates, the study population has different sources of income from agriculture up to bamboo products. The target of this study was bamboo and it has a great income role in the study community as indicated above 18.34 percent of the respondents depend on different bamboo products for their livelihood. The agricultural activity mentioned here includes mixed farming, where crops/vegetables and livestock were managed in combination. The main crops cultivated were barley, beans, peas, onion, cabbage, maize, coffee and "enset".

Yet the income generated from bamboo ranked second in importance as a source of household income in the study area. Despite the relatively low contribution of bamboo to household income, the role it plays is appreciated by the majority of the respondents. Accordingly, 96% of the sample households owned bamboo and generated income from it.

The annual income generated from the sale of bamboo ranged from 260 Birr for the small income gainer to 5250 for huge income gainers from bamboo per annum. As key informant interviews and focused group discussion indicated, different bamboo products are sold and bought. For instance, local crop storing material called "yesiya" in the local language, local crop sieving material called "gilla" in the local language, local beehive, bamboo sit/desk, bamboo for house construction and bamboo shell for roof cover, bamboo for fencing, etc (Figure 2).



Figure 2. Focus group discussion.

Utilization of bamboo other than for income

The local people indicated that bamboo is used for a variety of local or traditional applications in the study area. The applications include construction, fencing, fodder and household furniture.

Of the households, 80% expressed that the view that the usefulness of bamboo has no parallel, compared with any other species found in the locality. The uniqueness of bamboo, as expressed by the locals, includes flexibility, strength, and fast growth, which makes bamboo more preferable than other tree species. Furthermore, 100% of the respondents valued most of the local uses over income generation. This implies that the marketing of bamboo in the study area is relatively undeveloped. In the construction of the traditional house roof, bamboo serves the dual purpose of both nail and corrugated iron, two independent component materials that would otherwise be required for building a typical house roof. Generally, in the process of

house construction, in the beginning, the wall is of mud, reinforced with the wooden poles and bamboo culms. The underlying layer of the roof the prospective ceiling is constructed by interweaving bamboo splits against the already fixed solid culms. The bamboo sheaths are stretched horizontally over this layer and tied by interweaving bamboo that makes the roof (outer layer) of the house. The layer of the sheath, mantled in the middle of the two layers, provides waterproofing by blocking leakage through the roof. The floors inside the house are also built by splitting the culms and interweaving them against each other at ground level. The types of houses traditionally constructed of bamboo, are called "phejja"/sak'ala (Figure 3).



Figure 3. Traditional house constructed from bamboo and other material in Essera district.

Bamboo is also used for constructing fences of various appearances that result from different orientations of splits while interweaving. The common procedures in fencing building are the erection of short cut bamboo culms on the ground following the fencing line, followed by a closely interlocking bamboo split against the erected beams until no holes are left (Figure 4).



Figure 4. The type of fence constructed from bamboo.

Bamboo sheaths and culms are also used for making umbrellas and mats of various sizes and shapes. Young leaves and new sprouts of bamboo are usually browsed by domestic and wild animals as fodder, hence bamboo plantations are fenced to protect young sprouts: traditionally this is called "Dulk'k'a". In addition to this, the evergreen nature of bamboo enhances the beauty of the region.

Bamboo resource owned and its management

The size of the bamboo resource owned by individual farmers is summarized below. The number of culms owned per household ranged from 217-15000, the average being 3512 culms per household. In terms of area, the average land allocated for bamboo cultivation was 0.09 ha per household (Table 3).

Table 3. Distribution of households by size of bamboo plantation.

No. of culms	Number of respondents	%
≤ 1000	12	20.4
1001-3000	19	31.5
3001-5000	9	14.8
5001-7000	11	18.5
7001-9000	7	11.1
≥ 9001	2	3.7

Source: Survey, 2018

As regards management, farmers, in general, did little. In most cases, once the stand was established, there was little follow-up management activity, except fencing and harvesting.

During community discussion, it was learned that their ancestors used to obtain rhizomes from wild stands, but after the natural stands become depleted, communities obtain planting material from peers whenever needed. For instance, 44.1% of respondents obtained planting materials from their friends as well as from natural/wild bamboo forests, while 52.7% established their stands with materials from natural stands. The remaining 3% obtained planting material from peers.

Establishment: During interviews, several informants responded that the practice of artificial establishment of bamboo stands was uncommon. However, there were rare cases of artificial restocking or filling of gaps due to harvesting, by planting culms. As most of the respondents related, during the inventory and field visit, the process of establishment starts from site preparation, i.e. the making pits, which are relatively deeper and wider than normal tree pits, prepared planting material, which is free from disease and 2-3 years old, with root systems, and planting in the previously prepared pits. They said that most of the planting is carried out during the beginning of the rainy seasons.

Tending and maintenance: During the interviews, the respondents replied that they did little about the tending and cultivation of bamboo stands, and thus relying mostly upon natural regeneration. However, some instances of weeding around new shoots, fencing, refining and thinning were noticed. As they mentioned, thinning was not common a tending operation commonly exercised. However, they did thin out especially to those stands affected by borers and disease, and the dry and over mature.

Harvesting: Generally, the interviews showed that the harvesting method was selective i.e., culms of the right sizes were selected, depending on the intended utilization, and on their maturity. Culms that have reached harvesting age are identified by color; they become yellowish and begin to be attacked by fungus. However, they also harvested immature culms for mats and some furniture making.

Management problems: During interviews and field visits, almost all respondents indicated that there were management problems, which affected product quality and quantity. They also responded that the buyers provided no advice concerning product quality; only one farmer said that a buyer

assisted him in identifying the stage at which a product should be harvested, and how it should be harvested. The major problems, as indicated by most of the respondents, were trampling and browsing by domestic animals and wild animals, borers and diseases that affect the bamboo stems, decay of new shoot, and sometimes drying before they have reached maturity. All of these problems could be attributed to a lack of knowledge and inadequate support from experts. The major responsibility for managing a bamboo plantation is said to lie on the head of the household; he or she is responsible for protecting and maintaining the plantation, and for taking decisions on harvesting and selling. The other family members were also responsible for the protection and maintenance of the plantation.

Discussion

Roles of Bamboo in the household economy

This study indicates that households in Bule district domesticate and cultivate bamboo both for household applications and for generating cash income. This study agrees well with the wealth of literature [15] that indicates the tremendous socio-economic role of NTFPs, as crucial elements of livelihood strategies across a variety of settings. The importance of NTFPs including bamboo for rural households, especially at times when alternative incomes, food, or animal fodders are scarce, is well-documented [15]. The present study also indicated that agriculture alone could not sustain the overwhelming proportion of the households in the studied district and that support from other activities should complement household livelihoods. To this end, the role and importance of bamboo were found to be crucial in filling income gaps and supplying the needs of households for additional income.

Although bamboo is a versatile multipurpose perennial species with wide industrial and local uses, the community in the Essera district utilizes it mainly for traditional/domestic purposes and for sale to generate income. Yet, despite the overall low absolute income generated from bamboo cultivation, its contribution stands in the third place in importance. This is similar to the results reported by Shackleton [15], who indicated that four-fifths (79%) of his respondents ranked it second, while the remaining one-fifth valued it as of primary importance to their livelihood. The role of bamboo reported from the study is lower compared to that in reports from other countries such as Mvera, Malawi, where there is a considerable activity with bamboo. For instance, the result reported by Shackleton [15] in a study in which they compared the average cash incomes from the sale of bamboo and other household activities, indicated that bamboo played a considerable subsistence role in the livelihoods of artisans and bamboo vendors. Anji country, China, reported that bamboo is the second most important source of income after off-farm work, representing 25% of the total family income [15]. Shackleton [15] in Leo PDR in south Asia, also reported that the participants.

Ranked bamboo as their most important source of cash income, accounting for 40% of the households' cash income. This implies that the contribution of bamboo to rural livelihoods is considerable across various settings. Nonetheless, compared to the role that bamboo plays in other countries, its role in the Essera district in particular and Ethiopia, in general, is very low or underdeveloped. This also shows that a concerted effort is needed to boost the role and importance of this sub-sector, to obtain increased rural and national benefits. Similarly, the relative contribution of bamboo to household income from the present study, which amounts to 6%, is much lower compared to studies made on other NTFPs in other parts of Ethiopia. For instance, a study in the southern lowlands of Ethiopia indicated that one-third of the annual subsistence income of a pastoral household was derived from the sale of NTFPs [15] reported a 15% contribution of NTFPs to household income in Southwest Cameroon, where there is a considerable activity with NTFPs are practiced.

Interestingly, the role that bamboo plays varied from village to village, depending on their relative location concerning road and town (market centers), as well as on household wealth status. The rich have greater

advantages than the poor from bamboo cultivation, and households close to market centers have greater advantages than those distant from road and market centers. The rich households derive more income from bamboo than do poor households, contrasts with the finding of several studies, that poor households derive more benefit from the use of NTFPs than do wealthy or intermediate households [16]. Several studies indicate that rich households generate a greater absolute income from NTFPs than poorer households, while still, other studies have shown that the use of NTFPs is not strictly wealth-dependent, but depends on other factors, such as product.

specialization, proximity to the resource base and household dependency on NTFPs [17]. The present study also confirmed that differences in the utilization of NTFPs varied significantly with proximity to the market and the road network as reported by Ravallion [17]. The importance of the existence of rural infrastructure facilities, as well as of the complementarities among them, as an essential requirement for rural income growth and poverty reduction.

From the socio-economic study, it was observed that bamboo has an age-old connection with the daily life of the Essera district people, in the highland agroclimatic zone, where ecological conditions favor the growth of bamboo. More than 80% of respondents stated that the usefulness of bamboo is unparalleled by other equivalent tree species. According to the respondents, the main reasons for this are its workability, strength, accessibility and other characteristics (easy to propagate and high biomass). This implies that, because of its characteristics, the community perception of the utilization of this species relatively higher than that for other tree species. The remaining 20% of the respondents indicated that it is as useful as other tree species. owing to its workability, durability, strength, and accessibility, it is given the first preference for construction and other activities.

The social survey indicated that bamboo resources are used for limited purposes when compared with their potential use. They are mainly used for the construction of house roofs and walls, in fencing, as fodder, and for making furniture. In the study area, bamboo is primarily consumed for domestic use or used for income generation, through the production and sale of raw material. Almost 78% of the respondents used it primarily for house construction, and the remaining 22% used it for fencing. Similar results were also reported by CSA [11] that most rural households mainly use bamboo as raw material for construction, fencing, making house utensils and as a source of domestic energy.

Apart from domestic consumption for constructing traditional houses, fencing, fodder, and making furniture; bamboo was used to generating income through the sale of raw bamboo raw material.

Conclusions and Recommendations

Conclusion

Households in the study area are engaged in a variety of farm and off-farm activities using their asset endowment. Bamboo is one of the livelihood strategies of the households and has a pivotal function as a coping strategy to fill income and subsistence gaps of different categories of people in the area. Bamboo is appreciated in the area, above all because of its domestic/traditional uses. The increasing importance of bamboo, both for household applications and as an income source, is extending its domestication. However, the role it plays depends on socio-economic status and market and road availability. Unlike other categories of NTFPs, the advantage of bamboo is utilized more by the rich than by the poor, and by those closest to the market or along roadsides.

Bamboo is versatile in use. The survey results showed that the utilization priorities for bamboo in the region were for house construction, fencing, and income generation, furniture-making and as a source of fodder, in order of importance. Utilization systems were merely bound to traditional ways and depended on obsolete technology.

Despite its increasing use and the expansion of its cultivation, there are no profound bamboo management practices that have traditionally been developed in the survey area. In most cases, once it is established, there are scarcely any additional tending operations.

Recommendations

The following recommendations are given to promote the bamboo sector and to ensure equitable benefit-sharing by the communities that grow bamboo, the processing and marketing enterprises and the national economy at large.

Government and international funding agencies should support short-term training and research for the overall development of the bamboo sector

- There is a need to organize bamboo traders and craftsmen into associations, to enable them to participate in the bamboo trade from a position of strength
- Good marketing infrastructure and a reliable information system should be developed, mainly to address the lack of awareness by consumers about the price and competitiveness of bamboo products
Need for improved marketing practices
- Acquisition and dissemination of appropriate bamboo technology for bamboo cultivation, processing, and utilization
Creation of public awareness concerning bamboo uses, at all levels and by all possible means
- Strengthen development support to a bamboo growing and through extension, activities use communities to sustain the production and utilization of bamboo
- Provide skilled training in the design and manufacture of good quality bamboo products
- Conducted on detailed analysis of the value chain, management, and utilization to enhance productivity and consumption
- Farmers use traditional propagation methods. Hence, their way of propagation may not cop with large consumption of bamboo if large-scale processing starts. Research works on propagation methods should be strengthened and knowledge transferred to producers

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