THE ROLE OF INDIGENOUS KNOWLEDGE FOR BAMBOO RESOURCE MANAGEMENT, THE CASE OF BITTA WORDA SOUTH-WEST ETHIOPIA

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ACRONYMS (abbreviation)

EFAP - Ethiopian forest activity programmed.

EPRDF - Ethiopian People's Republic Democratic face.

NTFP - Non - Timber Forest product.

RSCU - Regional Soil Conservation Unit

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ABSTRACT

Bamboo is component of indigenous agro-forestry practices in bitta district southern Ethiopia .It is one of most versatile plant in the world with over thousand uses and fastest growing plant. These research paper describes the highland bamboo forest and farm wood lot of bitta and its actual value for the society, the available indigenous knowledge used to bamboo,the evaluation of bamboo on farmland and the economic contribution of bamboo in selected villages in bitta districts .The objective overcomes the major problem of reduction of bamboo resource to meet the growing demand of forest product increasing population . The methodologies employed to obtain the information repaired here in one (2) literature review on bamboo species (1) a field survey on the available indigenous knowledge used to manage bamboo ,the evaluation of bamboo on farm land and economic contribution of bamboo household survey. The primarily information is gathered from key informant and focus group based on this information to design question for household. Bamboo made appearance in bitta for long period of time, this resource Is now being decreased due to poor management for the stand immature harvesting agriculture, cut it out of the proper time shortage of the land expansion and over exploitation due to population growth. The trait of bamboo as the fastest growth multi-purpose plant with an excellent capacity to reduce the pressure on our dwined long forest as substitute for timber is highlighted. As strategy to increase the production of bamboo in sustainable base is suggested. Proper management and exposition are considered the principal component of strategy to develop the bamboo resource bitta management approaches are suggested to improve the productivity and quality of bamboo forest of bitta

Key word:-

Agroforestry practice Indigenous knowledge Sustainable bamboo forest utilization

Versatile plant

1. INTRODUCTION

1.1. Background

Bamboo is one of the oldest building material used by mankind (7).the bamboo clum ,or stem has been made in to an extended diversity of products ranging from domestic household products to industrial application, example of bamboo products are food containers, skewers, chopsticks, handicraft, toys, furniture, flooring, pulp and paper, boats, charcoal, musical, instrument and weapons. They are distributed mainly in the tropics, but occur naturally in sub tropical and temperate zones of all continents except Europe. The species are found at latitudes from 46N to 47 S and from sea level to 4000 m elevation Bamboo is one of the most versatile plants in the world with over a thousand uses .it is fastest growing plant in the world and its poles are the strongest and lightest natural material known to man . Bamboo is multi-purpose plant of high economic and environmental values that convert solar radiation in to useful goods and services better than most tree species. It is ideal to help control soil erosion for the very same reasons that some homeowners hate it. Running bamboo has a net like root system that creates an effective mechanism for water-shed protection. It works to stitch the soil together along fragile riverbanks, deforested areas and in places prone to earthquakes and mudslides .in addition to this it is well known for industrial uses, lesser known is the use of young bamboo shoot as a food. The juvenile shoot is not only delicious but are rich in nutrient components, minerals and fiber and are low fat and sugar (Kassahun, 2003), There are 1575 bamboo species in the world 14million hector of land . Africa has only 43species covering about 1.5millon hector of land .Ethiopia has two indigenes bamboo species, [Arundinariaalphina and Oxytenantheraabyssinica]. About 67% of the African bamboo resource are found in Ethiopia (Lalchlan ,2002).the lowland bamboo [oxytenantheraabyssinica] forest of Ethiopia is a clump forming type with solid clump that constitute about 85%of the bamboo forest of the country .the highland bamboo [ArundinariaalpineK.shmondin] forest non clump forming [single stemmed]species with hollow clump .The former is deciduous while the latter is ever green (Kassahun, 2003). One of the highland areas in Ethiopia is the south western highland .These highland are located in the bittaworda has high altitude through year rainfall resulted in make it suitable ecological zone for growing of highland bamboo. There are two bamboo species in bittaworeda growing species found in the bittaworeda are Arundinarya.

Alphina that constituted about 98% of the total bamboo forest of the woreda and Arundodonex [shebekomeka which grow in the weynadega part of the woreda.

Bamboo is an important component of life in bittaworeda ,farmers rely heavily on this versatile group of plant they used bamboo to make weaving equipment, different furniture, to construct house and fence.

1.2. Statement of the problem

Statement of the problem

Documentation about the role of indigenous knowledge for bamboo management is essential to improve understanding of the domestic and economic role of bamboo in Ethiopia (Arsema ,2008; Kelbessa et al., 2000; Guadie *et al*., 2019; Bahiru *et al*., 2020). However, its productivity is not checked regularly, and also there were no documentation about the contribution of bamboo, and the role of indigenous knowledge for bamboo management in bitta Wereda.). Most of The Ethiopian communities that utilize bamboo are mostly isolated, not integrated with potential markets, and there is a poor management practice in natural bamboo habitats (Arsema, 2008; Levang *et al*., 2005; Mekonnen *et al*., 2014; Bahiru., 2020).

Most rural communities with long existing customary practices use different forest products for household equipment and furniture making. This is true that people living at Godefo and hamani have similar long usage or tradition of using such gifts of forest for, tools utensils furniture's and other purposes of such forest plants save the community in the rural and town. Household bamboo the scientific name Bambosoideae familypoaceae is ever green perennial flowering and hollow type of tree grow either naturally or with human farming. It is apparent that people in rural and remote areas. Produce tools equipment and furnitures out of bamboowith the long existing customary practices. Now adays however with the expanding industrial products these customary practice of using bamboo is gradually declining in rural areas. Inspit of these however an evolving use of bamboo for furniture and various tools at town and limited rural areas still servive. This study tries to identify the long usage and the serviving purpose of bamboo in the study areas and make a recommendation for the sustainable utilization of this resource.

1.3. Objective of the study

1.3.1. General objective

The overall objective of the research was to assess the available indigenous knowledge used to manage bamboo forest in bitta woreda

1.3.2. Specific objective

- To assess uses of Bamboo for local community in the study area
- To assess the role of indigenous knowledge for sustainable use of bamboo

1.4 RESEARCH QUESTIONS

1. For what purpose bamboo used for local community?

2. What is the measure cause of bamboo resource degradation?

3. How can you manage bamboo forest?

1.5. Significance of the study

It provides information to take crucial and effective action required to secure the future existence of bamboo resources as well as the formulation of strategies for dealing with increasing production from existing bamboo forests. The finding of this research inform some literature gaps as input for further research institute, policymakers, academicians. The identification of the role of indigenous knowledge for bamboo management will help the Ethiopian Government in designing effective programs to boost households' income in the short term and the country's economy in the long term through production and sale of highland bamboo. The findings of the study also important to local farmers to inform them about the contribution of the bamboo resource for different aspects and indigenous knowledge for bamboo management.

2. LITERATURE REVIEW

2.1 Description of bamboo

Bamboo is multipurpose plant of high economic & environmental value that converts solar radation in to useful goods & services better than most species of tree (kassahun,2003). If there is indigenous species in Ethiopia that can replace Eucalyptus, that is only bamboo (NTFP hand out).botcganically bamboo is grass (EFAP,1994). It belongs to gramineae family &bambusease sub-family (kassahun, 2003).

Bamboo is tall potential grasses with tree stature that grow up to about 30m in height & 35cm in diameter. The maximum size measured in the indigeneouse bamboo forest of Ethiopia was 23m & 20cm in height & diameter respectively (kassahun, 2003). The main stem of above ground part of the plant is the Culm, while the underground part consistutes the rhizome & root system. The rhizome is the structural foundation of bamboo plant on which its mechanical anchorage, growth, vigor& spacing depend (kassahun, 2003). Arundineriaalphinak.schum (1895) Synonym; Sinarundinariaalphina, yushaniaalphina is one of the indigenous bamboo species to Ethiopia, which grow at the high land agro climate zone. Generally the stem color is green, becoming yellow when mature. The stem is smooth on the outside; hollow on the inside, but with thick walls, leaf blades are 13 to 20cm long & 8 to 16cm wide, with cross vein present. The flower are in the panicle 10 to 15cm long, but flowering is in cycle of fifteen to forty years, after which all the plant die down (Lachlan, 2002)

2.2 propagation of bamboo

Most bamboo plants flowers only once in their life time (14-50) year in most species than die soon after (kassahunemebaye). It emerge again from germinating seed if site is not severally disturbed by determinal factor such as rodent, fire … etc. New bamboo shoot are produced every rainy season from rhizomes buds that attain full height and diameter in about 3 months in fully development rhizomes- root system , which occur 3 to 7 years seedling or establishment by seed (kasshun, 2003). It can be propagated by seed, if watered daily but there is rarely seed available. The plants propagated by seed do not develop as quickly as those propagated vegetative (Lachlan, 2002).

2.3 Uses of Bamboo

Bamboo plays an important role in the lives of people. Most of the farmer south west, western and central highland and low land of Ethiopia use bamboo for houses construction fence, fire wood, furniture, ceiling and other immediate needs. Few small-scale industries in villages and some of the town in the country produce bamboo products. It is considered one of the older building materials, furniture, musical

instrument, sport equipment,… etc used in the rural area and villages, and is popular many due to its availability, low cost, strength and the fact that is a high yielding renewable resource (sisay,2001)

2.4 Socio-economic importance Of Bamboo

Bamboo made its appearance about 200 million years ago. It is perhaps the fastest growing plant on earth. It growth three time faster than eucalyptus species and can harvested four time as often. Its lightness and high module of elasticity (9000 to 10100N/mm2) and rupture (84 to120 N/mm2) make bamboo an ideal material for housing in area prone to natural calamities such as earth quake and hurricanes. The tensile strength of bamboo is greater than that of stet. (sisay, 2001).

2.5 Bamboo as a multipurpose spices component of agro forestry.

Bamboo is an important component of life in rural communities in many part of Asia. Farmer in countries such as India,Bengladesh, Indonisa,Thailand andnepal all rely heavily on this versatile group of plants. Poverty alleviation and involvement of women in rural development are two frequently cited aim of development effort associated with bamboo. In all these respect bamboo offers an important resource for development and exploitation, which has been neglected for too long (agro forestry news, 1993). In kakala, india bamboo is an important component in home garden; about 30% of the bamboo used in industry comes from these multi- strata agro forestry system. Bamboo is used to make agricultural implements, basket mats & other handicrafts: bamboo thorn is used in fencing. But as the demand for bamboo raises the supply from home garden & forests is decreasing because of over exploitation (agro forestry news.1994).

2.6 Bamboo forest management

The bamboo forest has a greater significance to the rural people than the food alone derived from the tree's. The abundance of bamboo and it's ability to grow rapidly and spontaneously, has been some of the hindrances in the past of neglecting to develop this natural resource. The depletion of this resource, due to population pressure, has renewed interest in this group of plants (Liese,W. 1985).

Bamboo are the important components in the traditional land use system of Barak valley. The traditional practice of village bamboo management in home garden system was studied in the Cachar district of Barak valley , Assam. Utilization of village bamboo for fulfilling basic rural necessitate supports the maintenance of village bamboo diversity. Traditional management of village bamboo has recognized the formation of certain societal groups that forms a complex inter linkage and generate rural employment. Traditional practice of moulding of soil to the bamboo clump, addition of leaf litter and farm yard manure to the

bamboo clump is of practical important and have scientific basis. Clear felling strategy of bamboo clump management for commercial utilization has severe effect on the clump growth parameters that can endanger the village bamboo productivity (Indian jornal of traditional knowledge

3. MATERIAL AND METHODS

3.1. Description of the study area

This survey study was conducted inbitta Wereda in south nation nationality people regional state south west Ethiopia. Bitta worada is one of 12woreda found around bonga town. Bonga is located 106 kilometer south west of jimma. The study sites are from the 24 kebele its name is Godefo and Hamani extends up to 15kilometer west of bittaworeda .

3.1.2. Climate and Topography

Godefo is high rainfall area that range between 2000-2400mm annually by bimodial distribution. Godefo is located at an attitude range of 2400-2600 meter above sea level and the climate of Godefokebele is very low land and the topography of that kebele is Steep slope and agricultural system and land use type is mixed farming. (Bitta woreda Agricultural and Rural Development office)

3.1.3 .Population

According to 2012 CSA Projected 2015 district has total population 93,585 from this 46326 males and 47259 females

3.2. Sampling Design

Bitta Woreda has 24 rural kebeles out of this only two kebele were purposively selected. Namely Godefo and Hamanikebele based on bamboo production and utilization practice. From the selected two kebeles, total of 90 farmer were selected randomly by a lottery methods. random sampling with regard to sampling subject's fair key-informant and 10% of the house hold per, village was selected.

3.3. Data source and data collection methods

Both qualitative and quantitative data were collected from important primary and secondary sources using a combination of data collection tools. The primary data of the study were collected from sample farmers in the selected kebeles using individual household survey, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and direct Observations. Secondary data sources

The secondary sources of information including, investigation journals, articles, internet sources or websites different agriculture, and rural development office reports, and document reviewed at different levels of

government organizations were used.

Household survey (HH)

Household survey was a formal survey method follow semi structured interview used for collect primary data. However, in this study follow semi-structured interview in order to collect both quantitative and qualitative data. Reconnaissance survey was undertaken prior to actual data collection in the study areas to get a general overview of bamboo producers and baseline information of the areas. Following the indication of reconnaissance survey, data collection questionnaires were prepared in English and then translated into local language (kefa). After questionnaire development, the questionnaires were pre-tested was conducted from 5 selected farmers from sample kebeles to evaluate whether the questionnaires were prepared in the way that clarify communication between interviewers, and interviewed regarding to research objective.

The household survey data includes socio-economic characteristics of households such as (age, educational level, sex, marital status, family members, occupation, household income, etc.), resources such as livelihood activities, landholding, area coverage of bamboo in hectare within individual respondents which include the economical aspect, and social, and economic contribution of high land bamboo. The data also include Indigenous knowledge, Bamboo management.

Focus group discussion (FGD)

Group discussions were held with elders, and well experienced people to get information about the role of indigenous knowledge for bamboo management,. It includes from 8-12 members of discussants and selected based on taken information from development agents (DA) and chairman of sample kebeles. During group discussion every individuals like men, women, and youths were included in the discussion to get different information. The advantage of this method was that it allows the interaction with key informants, and allows the researcher to focus on group norms, and dynamics around the issues being explored (Nyumba, *et, al.*, 2018).

Key informants interview (KII)

Key informant (KI) involves exploring the technical knowledge. KIs were defined as persons they are knowledgeable and they tell as the general over views about the role of indigenous knowledge for bamboo management, the previous and current situation of the area, its role for local community, Those were lived in the area continuously for long period of time. Key informant interview was used to gather important information's which are relevant for the study. Selections of these KIs were selected from elders, religious leaders, local leaders and experts based on the knowledge about bamboo plant its role for local community the role of indigenous knowledge for bamboo management.

Direct Observation

Guided field walks was performed with informants as they were interviewed during the trip as conducted (Ashagre, M, 2011). Field observation was carried out during the study with the help of local guides, and key informants to acquire the necessary data. This involves not only observations, but also interviewing, and discussing informants while walking in the study sites. The purpose of direct observations were to complement and triangulate data collected through questionnaires, KIs, FGDs and verify produced and maintained by farmers the study kebeles.

3.4. Data Analysis

Data sets collected through different methods described above, were analyzed to address the specified objectives and answer the research questions of the thesis. Data analysis started with imagining of the data, especially its focus on the absence of uncertainty, irregularity, missing values, and redundancies. This was conducted carefully before the start of the interpretation of the data using various analytical tools. These analytical tools were selected based on the nature of data, and objective of the study. Those the collected data's were analyzed by descriptive statistics (such as frequencies, percentages, mean, and standard deviation

4. RESULT AND DISCUSSION

4.1 Socio-economic Characteristics of respondents

The result of household characteristics(Table 1) indicates 28.28% of household had a family size of 1-4, 33.95% of them had 5-8 while 24.44% of them had 9-10 and 13.33% had 10 and above. Regarding sex composition of sample household had 86.67% of them were male and 13.33% of them were characterized as female headed.

Table- 1. Socioeconomic charactersticsofrespondntes

Vriabel	Respondents	Frequence	Percent
Family size	1-4	26	28.28
	5-8	30	33.95
	9-10	22	24.44
	>10	12	13.33
	Total	90	100
Sex	Male	78	86.67
	Fmal	12	13.33
	Total	90	100
Age category	18-35	36	40
	36-50	40	44.45
	>51	14	15.55
	Total	90	100
Education	Illiterate	50	55.5
	1-8	36	40
	9-12	4	4.44
	Total	90	100

In this section all data gathered is presented and analyzed .The data has been divided in to two sections. The first section deals on the response of the key informant and focus group interviewed from the two sample case kebelesGodefo and Haman

The second section deals on the response of the sample household of sample kebeles. Besides the interview and question responses and information, the researcher also collected same important photography during field observation, which witness of the objective reality on the ground .These photographs are intended to support the reliability of the information obtained through

question and interview.

The researcher selected 90 farmer to conduct interview from the above mentioned kebeles .Under each of sub-heading, an attempt has been made to present the data first and to after the discussion next

4.2. Bamboo in the study area

Table. 2. Estimated areas [ha] of bamboo field at study sites

Area collected for bamboo	No of respondents	Percentage
0.002 ha	8	8.8
0.03125 ha	30	33.3
0.0625 ha	21	23.3
0.125 ha	9	10
0,25 ha	7	7.7
No bamboo filed	15	16.9
Total	90	100

From the above table 2 we can see that 33.3% of respondent have 0.03125ha of bamboo field and 23.3% of respondent have 0.0625 ha of bamboo field in the study area. This fact tells us that although the farmers have a good trend of planting habit of bamboo in their field .The size of the field is very small They produce bamboo mostly for their local consumption

4.2.1 Evolution of bamboo in the study area

Bamboo is the fastest growing on earth, However it is a resource threatened by agriculture expansion and over exploitation .from the field survey this fact show as bamboo as well known and distributed in the study area as bamboo made it's appearance for a long period in the area.

Table 3: Evolution of bamboo on farm wood lot

ITEM	No Respondent	Percentage
Not a long period of time	-	-
<25 years age	-	-
25-50	12	13.3
>50year	78	86.7
Total	90	100

As indicated in the table, 86.7% of the respondent clearly indicated that bamboo made it appearance too along period of time [>50year age] .These fact of the study area strongly agree with Sissy's researcher paper

Bamboo is an important component of life in Bittaworeda, farmers rely heavily on this versatile group of plant they used bamboo to make weaving equipment, different furniture, to construct house and fence .from the field survey all respondent clearly indicated that the current situation of the bamboo resource in the study area is decreasing

4.2.3 The major case of decreasing bamboo resource in the study area

Table.4 the major case of decreasing bamboo resource in the study area

Item	No of respondents	Percent
Poor management	7	7.7
Cut bamboo out of the proper time	5	5.5
Over exploitation of bamboo	15	16.6
Shortage of land	3	3.3
All of the above factors are case	60	66.9
Total	90	100

All the study village in Bitta district the major cause of decreasing bamboo resource are improper management ,that include poor management of the stand ,cutting bamboo out of proper time ,shortage of land and over expoil0tation of bamboo due to population growth .This was indicated by the majority of respondent 66.9%.

4.4 Uses of Bamboo Resources in The Study Area

Bamboo plays an important role in the live of peoples. It is one of the most versatile plant in the world with over a thousand uses It provide both economic and environmental uses As bamboo appear from a long period of time in the study area. The people of bitta also they use bamboo for different purpose locality. In this survey almost all respondent indicated that they use bamboo for house construction fence, flooring, furniture like chair table bed enset processing tool etc, weaving equipment, container for grain, bee hives fodder and wood

Table 11 Farmers response on utilization of bamboo

Item	No of Respondent	Percent
House construction and fence	46	51
Flooring and Furniture	12	13
Inset processing tool	10	11
Container for grain	8	9
For bee hive	5	6
Fodder and wood	9	10
Total	90	100

Out of total respondent all 100% uses of bamboo in order to house construction, fence, containers for grain, weaving tools, bee hives, fodder and fire wood

4.4.1 How long the bamboo house last for

In study area bamboo is one of most important material for construction of their house. It is used as well as attach as a nail, as a door and soon. The sheath of bamboo used to make the thatch not to buy corrugated iron sheet and nail to construct their house.

Table 12 farmer's response on how long does bamboo house last for

Item	No of Respondente	Percent
From 25-40 years	21	23
From 40-60 years	42	47
From 60-70 years	4	27
From 70-80 years	3	3
Total	90	100

If the thatch maintains properly and the house yet smoking in good bamboo house be last for 60-70 years. At the study area this was indicated by the majority of respondent 45%.

4.4.2 Bamboo as a medicine

According to the field survey 59% of respondent pointed that they do not use bamboo for medicine. But 41% of the respondent indicated that they use bamboo as medicine for the cough of cattle by feeding the leaves of shembko variety. In adding they explained that same bamboo produce sprerical objective at the top at the age of 60-70years. By collecting this thing and cutting in to pieces then feeding it to cattle's as a medicine for cattle's cough. From this fact we can understand that although same farmers used it as a medicine the majority of the farmers do not use it as a medicine.

4.4.3 The role of bamboo in soil management

A, soil erosion control

Table 13 response of farmer on the views that bamboo forest preventing soil erosion and promoting water percolation

Item	No of Respondet	Percent
Nuteral	-	-
Agree	19	31
Strongly agree	71	69
Total	90	100

Bamboo forest is preventing soil erosion and promoting water percolation. This view was agreed the majority of respondent 64% this fact strongly agree with the following analysis of kassahun, (2003)that bamboo forest are characterized by a complex net work of rhizome ,root system ,which make that excel other forest in effectively holding soil particles thereby preventing soil erosion and promoting water percolation.

B, Enhancing soil fertility

Table 14 response of farmer on bamboo litter fall improve soil structure and fertility

Item	No of Respondent	Percent
Strongly disagree	65	72
Disagree	14	16
Neutral	-	-
Agree	11	12
Total	90	100

Bamboo litter fall does not improve soil structure and fertility. This view was indicated by the majority of respondent 67% farmers explained the fact in such a way that bamboo forest field which converted to crop land is not productive. In order to maintain the fertility of the field should be planted inset first and then use as crop field. This fact of the study area strongly disagree with the following analysis of Kasshun(2003) that bamboo litter fall improve soil structure and fertility.

4.4.4 How farmers value bamboo from other species

Table 15 farmer's response on house they give value to bamboo then other tree species

Item	No of Respondent	Percent
Low value	-	-
The same of other tree spps	1	2
High value	7	17
Very high value	26	81
Total	90	100

At the study village farmers give a higher value to bamboo than other tree species. This was indicated by majority of the respondent 81%. This fact tells us that, how bamboo is important resource the farmers. It gives a versatile use and makes their life ways. Famers use with bamboo for house constracution, fence, furniture and other immediate needs. That is why they give a very high for bamboo then other tree species.

4.5 Economic contribution of bamboo in the study area

Besides the local use of bamboo it is used as a means to generate in came for farmers from the field survey about 70% of the respondent indicates that they sell their bamboo product in the village and neighboring village in the form of bamboo poles for house and fence construction for the farmers who do not have bamboo field . About 25% of the respondents sell their bamboo product in bitta .baskets bee hives and soon .According to agro forestry today [1994] In Kerale, India, about 30% of bamboo used in industry comes from the home garden strata agro forestry system. This fact indicated that besides the local consumption of bamboo it is good means to generate income for the farmers.

Table 16 indicate the percentage of income the farmers get from the bamboo sell out of their total in comes

Item	No of respondet	Percent
10 % of from total	6	7
5% of from total	24	27
1% of from Total	36	40
2% from total	16	18
We do not sell	8	8
Total	90	100

At the study village farmers get in come from bamboo sales within a range of 1% -5% out of their total annual income. This was indicated by majority of the respondent 92% table 13. These facts tell us that although bamboo has an important economical value most of it's used for local consumption rather than for income generation.

4.3 Indigenous Knowledge for Bamboo Resource Management Bitta

Bamboo made its appearance in the world for a long period of time;This fact is also true to Bitta woreda because of this the people of Bitta have rich indigenous knowledge to manage bamboo.

Table 5. the Niche of bamboo on farm land

Location of bamboo plantation	No of Respondentent	Percentag
At the boreder	25	28
At sloppy land	8	9
At home stead	45	50
Atsream bank	12	13
Total	90	100

The niche of bamboo at the study village in bitta districts are mainly at home stead and at the border of farm land. in same case farmers planted bamboo at stream bank and at sloppy land .Table 4 show that 50%and

28%of the respondent planted bamboo at home stead and at border of farm land respectively . the other22% respondent planted it at stream bank and at sloppy land .This fact of study agree with the following analysis of Agro forestry today [1994] that in Kalalla ,India Bamboo is an important in home garden ,about 30% of the bamboo used in industry came from these multi-strata agro forestry system.

4.3.1 How bamboo regenerate in study area

From the field survey 100% of respondent pointed that bamboo regenerate naturally from rhizome buds ,although it can propagated by seed and cutting ,these practices do not known in the study area. The fact of the study area strongly agree with the following analysis of (Kasshun, 2003) that new bamboo shoot are produced every rainy season from rhizome buds that attain full height and diameter in above 3 month in fully developed rhizome root system .This fining is also in the line with the report of(Lachlan,2002)that indicate bamboo can be propagated by seed if water daily ,but there is rarely available .The plants propagated by seed do not developed as quickly as these propagated vegetat

4.3.2 Transplanting time of new shoot

Table 6.farmer response on the time when they transplant the new shoot

Item	No Respondent	Percent
April	68	75.5
Jun	12	13
July	6	7
August	4	5
Total	90	100

At the study village in bitta district, April IS The most suitable time for transplanting new shoot .This was indicated by the majority of the respondent[75.5%]

4.3.3 Age of bamboo at which it flowering

From the field survey 53% of respondent suggested that bamboo does not flower at all .from the available literature it is clear the bamboo plant flower since farmers in the study area used to propagate bamboo from the rhizome bud ,it might be difficult to now the age and flowering time of bamboo.

4.3.4 Maturation time of bamboo clumps

Table 7.maturation age of bamboo clumps for use

Item	No of Respondent	Percent
3 year	71	79
4 year	8	9
5 year	2	2
From 5-7 year	9	10
Total	90	100

At the study village bamboo clumps matured for use at the age of 3 year after it sprouts. This was indicated by the majority of respondent 79%.Inthe study area there is no trend of use bamboo for food .But monkey eat the new shoot of the bamboo at early age.

4.3.5 Type of bamboo in the study area

Farmer of different countries have their own indigenous mechanisms to differentiate different plants .From the field survey 97% of the respondents agree that the presence of two type of bamboo in their area .There are manynames for the various type in bitta. The major ones include shinato and shembeko

4.3.6 Time of the harvesting of bamboo in the study area

Farmers have their own knowledge when they should cut bamboo and when they should not cut it .The following table fells us the specific time [month] to cut bamboo in the study area.

Table 8 time of harvest bamboo in the study area

Item	No of Respondent	Percent
October	3	3
October-January	72	80
November-January	8	9
March and Apirl	2	2
April-September	5	6
Total	90	100

The specific time (month) to cut bamboo at the study area is from October to January.This was indicated by the majority of respondent 80% .The respondent also confirmed that if they cut bamboo out of these month .it will reduce the regeneration capacity.

4.3.7 Indigenous knowledge on diseases of bamboo and control measure

A disease is a constant irritation producing same kind of physiological abnormalities caused by a pathogen or Environment. A plant is health or normal when it can carry out its physiological function to the best of its genetic potential . Whenever plants are disturbed by pathogen or by certain environmental condition it cannot carry out its physiological function, then the plants becomes diseased (MengistuHulluka, 1982).There is a disease that attacks bamboo in the study area from the field survey 98% of the disease was caused by fungus .They explained the symptom of the disease in such away ,first the plant is invaded by aphids and then the black moss of sooty molds cover the plant and kill .The disease is transmissible to healthy one .The part of the bamboo that attack by disease are the whole parts of plant l.e the leaves, the clump and the root. Farmer of different countries have their own indigenous control mechanism for different plant disease .The following table tell us how the farmer in the study area control the bamboo diseases

Table 9.response on indigenous diseases control measure

Item	No of Respondent	Percent
By using anti fungus	-	-
By cutting out the bamboo that attached by the disease fro the sand	33	37
By burring the tools cut the diseased bamboo in fire	-	-
By burring the litters from disease bamboo	-	-
By the above except the first one	57	63
Total	90	100

The indigenous disease control measure at the study village is by cutting out the diseased bamboo from the stand, by burning the tools that used to cut the diseased bamboo in the fire and by collecting and burning the litters from the diseased bamboo. This was indicated by the majority of the respondent 61%.

4.3.8 Bamboo variety that resist to insect attack

According to the field survey 53% of the respondent confirmed that the shinato variety is resists to insect attack and wood is very strong .Because of this they used it for constructing their house and processing enset .The shembeko variety is susceptible to insect

4.3.9 Traditional bamboo forest management

The bamboo forest has a greater significance to the rural people than the food alone derived from the tree. The abundance of bamboo and its ability to grow rapidly and spontaneously, has been some of the hindrances in the past of neglecting to develop this natural resource. The depletion of this resource,due to population pressure has renewed interest in this plants.

Table 10 Farmer response on traditional bamboo forest management

Item	No of Respondent	Percent
Moulding of soil around the clump	17	18
Addition of leaf litter &manure	38	43
Selective and mature felling	35	39
Total	90	100

As observed in the study farmers use several bamboo management practice (Moulding of soil around the clump , Addition of leaf litter and farm yard manure to the bamboo clump and selective and mature felling)

5 CONCULUSSION AND RECOMMENDATIONS

5.1 CONCLUSION

The first strong human impact on environment and its resource base came with the historical transition of man from hunting and gathering to settled agriculture at about 10,000 to 12,000 years ago .The development of agriculture with increased food production leads to immense growth of human population on earth further exacerbated the human impact on environment and its resource. Among the resource vegetation, soil and water are primary target affect more by human being in all part of the world including our country. The study area is one of such part of Ethiopia. These resource are severally affected by population ,environment resource interaction process .Because of high economic and use value of bamboo in addition the present fast increasing population pressure forced the clearing of bamboo field for addition farm land . The study assessed that bamboo made its appearance in bittaworeda for a long period of time .As it made its appearance for a long period of time, it is found in most part of woreda. Although it distributed in most part of the woreda, the size of the field of bamboo owned by individual farmers is very small due to the shortage of land. Recently, bamboo resource has decreased rapidly. The main cause of the reduction of bamboo in the area include poor management of the stand cut bamboo out of the proper time, shortage of the land and over exploitation of bamboo due to population growth, the study also assessed the available indigenous knowledge used to manage bamboo in the study area. it indicate the output of the research agree with the alternative hypothesis and rejected the null hypothesis. The niche of bamboo in bittaworeda mainly found at home stand, at border of farm land and at stream bank. Propagation method is widely unknown. In bitta as just before new shoot come up from the ground, it is dug out and transplanted .There are various local name for each type .These include shinato ,shenbekoetc [in kaffigna].The various kind of bamboo are usually known by their sheath and by their inter nod .The harvesting time of bamboo in the woreda is ranging from September to January . It harvested out of these month ,it will reduce the generation capacity .There is disease that attack bamboo in the study area .It is caused by fungus ,The symptom of the disease is first the plant invaded by aphids and then the black mass of loot [sooty]molds cover the plant and kill it. They control it by cutting out the diseased bamboo from the stand, by burning the tools that used to cut the diseased bamboo in the fire and by collect and burning the litters from the diseased bamboo. Bamboo in the study area used for house construction ,fences ,furniture, and containers for grain weaving tools, bee heaves ,fodder and fire wood.

farmers in the study area strongly agreed on the view that bamboo forest preventing soil erosion and promoting water percolation but they strongly disagreed on the views that bamboo litter fall improve soil structure and fertility .

The farmer give high value for bamboo then other tree species because it give them a versatile use and it make their life easy .Although bamboo has an important economical value, most it is used for local consumption rather than for income generation in the woreda.

Bamboos are important components in the traditional land use system.Ttraditional Practice of molding of soil around the clump addition of leaf litter and farm yard manure is practical important. For enhancing the higher productivity of bamboo stand Scientific management of the clump through selectively felling of mature clump each year is desirable.

5.2 RECOMMENDATION

The above mentioned problem investigated by the study has to get solution .Thus, the researcher tried to give same suggestion based on the finding of this study.

The reduction of bamboo resource is one of most serious problem in the study area .To solve this problem , producing and utilizing it in a sustainable base is in dispensable. The existing trend of utilization bamboo in the study area is not in a sustainable base .Then fore it should by improved as much as possible .

To increase the production of bamboo in the study area the following work should done.

- Proper management for bamboo stand .in order to regenerate in a good manner the stand need cultivation and adding manure or compost. To do this educating farmers to develop their awareness and encouraging to managing their bamboo stand properly.

- As we have seen earlier, one of the major cases of decreasing bamboo resource is cutting it out of the proper time. Therefore, to increase the production of bamboo farmers should not cut it during sprout new culms. It is necessary to encourage farmers to seek another alternative in came generating option during this time.

- Although there is a shortage of land in the study area farmers should increase the planting habit of bamboo on the available field [like at home stead, at stream bank, at the border of the farm land and at sloppy field]. The expansion of bamboo plantation can reduce the pressure on our dwindling forest at a substitute for timber.

- As we have seen earlier ,farmer in the study area propagate bamboo only from rhizomes buds ,other propagation method are widely unknown .therefore further research should be done on the propagation method and should be introduced to the farmers .There is disease that attack bamboo in the study area it is caused by fungus this disease is transmissible .It is obvious that this disease is one of the factor to reduce the resource of bamboo .Although farmers in the study area control the disease traditionally ,they do not supported to control it scientifically. Therefore further research should be done on the bamboo disease and control measure mechanism and should be made familiar to the farmers.

  As we have seen earlier farmers in the study area produce bamboo mostly for local consumption rather than for income generation .This fact prohibits farmers not to produce it in large scale .If

farmers get more benefit from their bamboo products, they will produce it in large scale. Therefore modern commercial application opportunities such as wood and flooring should be created it will make good marketing option for farmers and encourage them to expand their bamboo plantation.

- Global links with other bamboo project should be formed by concerning sector in order to share same experience in the use and cultural of bamboo in other countries.
- Training programs to farmer and mass media should be used to spread the world on bamboos value in the area.
- Farmers in the study area identified bamboo in various types. They name shinato and shembeko [kaffigna] further investigation should be made to find out whether these are different kind of bamboo or varieties of Arndinaria alphine.

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