



People's Bamboo Production Status and their Livelihood Improvement in Dimla Upazila, Nilphamari District, Bangladesh

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Authors' contributions

This research work was carried out in collaboration among all the authors. Author MRAFN designed the study, wrote the methodology, partially performed analysis and first draft of the manuscript, author PG performed the statistical analysis and author TRB managed the literature searches. Authors MSR and SH read the manuscript thoroughly and finalize methodology. All authors read and approved the final manuscript.

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ABSTRACT

The bamboos are an amazingly multipurpose and useful group of plants. It is a fundamental part of human livelihood strategies in many places worldwide. This study focus was to know the state of bamboo, its' production and the available bamboo made products, to identify the knowledge requirement for increasing the bamboo production, to identify the ways of livelihood improvement by bamboo production and explore the causes of bamboo declining along with suggestion to overcome this. Data were collected using pre-tested interview schedule from a sample of 105 bamboo clump owners. This data collection was conducted in Tapa Kharibari union of Dimla Upazila under Nilphamari district during 1st December 2017 to 15th January 2018. Besides the descriptive statistical parameter, rank order was used for the analysis. The findings revealed that the bamboo production is declining at a gradual rate and has already decreased considerably in the study area. It is also explored that the local people mostly mentioned knowledge about better variety of bamboo is considered for increasing bamboo production. Furthermore, the means of

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livelihood is significantly influenced by bamboo production. The local people's livelihood therefore, is mostly improved through increasing income and creating employment opportunities. It is warning that due to rapid increasing of residents/houses bamboo production is declining as there are not enough homesteads or fallow land in the study area to have a bamboo clump.

Keywords: Rural people; bamboo; production status; knowledge and livelihood improvement.

1. INTRODUCTION

Bamboo is one of the fastest-growing plants on earth, gaining approximately 121 cm in 24 hrs [1]. Bamboo thrives through socialization with human culture. Bamboo is absolutely appropriate to agro-forestry since it's a woody grass. It is very interesting plant in their growth, morphogenesis, taxonomy, distribution, ecology and reproduction. It has also tremendously a wide range of worldwide distribution. Most bamboos are found in well drained, sandy loam to clay loam soils, derived from river alluvium of flat or gentle slope area. There are more than 1250 species in 75 genera of bamboos in the world [2]. There are more than 33 bamboo species have been found in Bangladesh out of which seven are occurring naturally in the forest of Chittagong Hill Tracts, Cox's Bazar, Sylhet and Northern Mymensingh in association with either tree species or as pure stand. The rest are being cultivated by the people in the village throughout the country [3].

Bamboo has many small but important uses such as fishing rods, flutes, fishing traps, handicrafts, walking sticks, packing cases for tea and fruits, cages for poultry, pipes for water supply and irrigation, cradles, cart yokes, bullock carts, ladders, winnows and sieving for cleaning grains [4]. It plays a major role in the development of many countries with over 2.5 billion people globally depending on it for survival and livelihood [5]. The domestic market for bamboo and rattan products in foremost producing countries was estimated at US\$ 34.2 billion, with an additional US\$ 2.5 billion of international trade in 2012 [6]. Global export of bamboo and rattan products reached its record high of US\$ 2,557 million in 2008 but slumped sharply by about 25% in 2009 due to the financial crisis. In 2012, the world export of bamboo and rattan commodities was about US\$ 1,881 million, of which 29% was industrialized bamboo products and 25% was bamboo woven products [5,6]. The size of bamboo use in *Agarbatti* industries itself in India has been estimated at Rs. 135 crore and bamboo utilized in ice-cream industries, kites,

crackers, and fishing rods has been estimated to the tune of 10 lakh tones annually [7].

Most of the people are living in rural areas of Bangladesh. They are poor and living below the poverty line. Bamboo is the low cost and affordable building material for the rural people. They play a major role in the development of many countries with over 2.5 billion people globally depending on it for survival and livelihood [5]. When the cost of building materials is high then it's about impractical for the inhabitants with their own affordability and renovates their houses after natural calamities that are very much happened almost every year in Bangladesh. Considering the wide range of uses of bamboo as construction materials it is called the 'the poor man's timber' in China, 'the friend of the people' in India and 'the brother' in Vietnam [8]. Nowadays, the price of bamboos is increasing but the supply is constant. That is why this can play a key role on the livelihood of the people. There are also millions of people for part or all of their income depending on bamboo [9]. Therefore, raising awareness of bamboo cultivation is very important for rural people in housing in Bangladesh. By analyzing the changing scenario of bamboo production, this study will be effective and will give valuable information for the concerned authorities of the Government of the Peoples' Republic of Bangladesh. Keeping in view the above facts the study was undertaken with the following objectives: i) to determine the socio-demographic characteristics of the respondents; ii) to know the state of bamboo, its' production and the available bamboo made product; iii) to identify the knowledge requirement for increasing the bamboo production; iv) to identify the ways of livelihood improvement by bamboo production; vi) to explore the causes of bamboo declining along with suggestion to overcome this.

2. METHODOLOGY

2.1 Study Areas

The study was conducted in Dakkhin Kharibari and Uttar Kharibari villages of Tepa Kharibari

union under Dimla upazila in Nilphamari district which fall under AEZ 2 named active tista floodplain. This upazila is 326.80 sq. km., located in between 26°05' and 26°17' north latitudes and in between 88°52' and 89°06' east longitudes. It is bounded by West Bengle of India on the north, Jaldhaka uapzila on the south, Hatibandha upazila on the east and Domar upazila on the west [10]. The study location is selected following purposive sampling technique. The reason for selecting the area is that bamboo grown well in that area and a lot of bamboo clump was observed at each homestead and besides the embankment of Teesta river and also roadside.

2.2 Soil Type of the Study Area

The soil types of the study area are irregular patterns of grey stratified, sands and silts. They are moderately acidic in nature and parent alluvium is rich in minerals. Four general soil types occur in the region; of which, Non-calcareous Alluvium predominates. Low organic matter content and CEC is also medium. In general soil fertility level is low to medium [11].

2.3 Land Use Pattern

Cultivated crops are Kharif: B. Aus, B. Aman, T. Aman, Jute, Kaon and Rabi: Tobacco, Mustard, Boro rice, Wheat, Grasspea, Chilli [12]. Authors observed that bamboo is growing naturally for a long time at the people's homestead with a little bit take care. Once upon a time bamboo was occupied a major portion in the homesteads of this area. At present bamboo production is being declining in this area though slowly but constantly due to population pressure and increasing house.

2.4 Investigating Procedures

The farmers of Bangladesh do not usually maintain records and accounts of their farms and homestead operations and hence there is no way to collect data from written materials for analysis [13]. Therefore, a survey was conducted to collect relevant data using pre-

designed and pre-tested interview schedule according to the objectives of the study. In this case, fully depends on the respondents' recall response for information. The sampling design is used like as follows.

2.5 Measurement of the Variables

In any research effective measurement of variable is very important. A variable is any characteristic, which can assume varying or different values in successive individual cases [14]. In a scientific research, the selection and measurement of variables constitute a significant task. In this connection, the researcher reviewed literature to widen his understanding about the nature and scope of the variables relevant to this piece of research.

In order to measure the status of bamboo production, way of livelihood improvement by bamboo production and other variables (socio-demographic characteristics) respondents were asked to answer the questions included in the interview schedule, number of citations was counted and converted to percentage for easy understanding. Ranking was also done as and when necessary based on the citations of the respondents. Pair wise ranking of Participatory Rural Appraisal (PRA) technique was also done. Each selected respondent was asked to answer all the questions included in the interview schedule. Proper statistical scales and methods were followed throughout the study.

2.6 Data Collection and Statistical Analysis

Data were collected during the period from 1st December 2017 to 15th January 2018 by using the pre-tested interview schedule in a face to face situation. Along with in-person interview, Focus Group Discussion (FGD) was also conducted. After completion of field survey all the data of the interview schedule were compiled. Local units were converted into standard unit. Appropriate coding and scoring

Table 1. The sampling design

District	Upazila	Union	Villages	Popul ⁿ	Sample	Reserve list
Nilphamari	Dimla	Tepa Kharibari	Dakkhin Kharibari Uttar Kharibari	625	105 (About 17%)	10

technique was followed to convert the qualitative data into quantitative forms. Statistical measure such as number, percentage, minimum-maximum, mean, standard deviation, rank order etc. were used in describing the various parameters of the study. For clarity of understanding tables were used to present the data. Data were analyzed by using software named Statistical Packages for Social Sciences (SPSS) version 22.0.

3. RESULTS AND DISCUSSION

The results and discussion of the study is presented as follows:

3.1 Distribution of the Discrete Variables of the Respondents

3.1.1 Gender

Data depicted in Fig. 1 shows that the majority of the respondents under the study are female and others are male. The percentages of them were 73.3% and 26.7%, respectively.

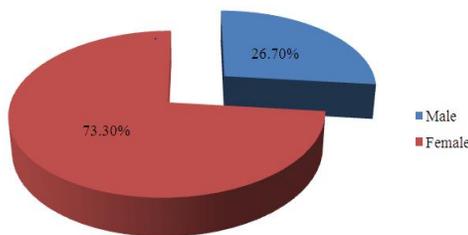


Fig. 1. Distribution of the respondents according to their gender

3.1.2 Marital status

Marital status referred to the nuptial condition of a person. It denotes social responsibility and in some way the maturity of an individual to live and run couple life. According to marital status of the respondents, it is illustrated in Table 2 that most of the respondents (95.2%) are married, 2.9% of the respondents are single and only 1.9 percent of the respondents are widow.

Table 2. Distribution of the respondents according to their marital status

Marital status	Number	Percentage
Single	3	2.9
Married	100	95.2
Widow	2	1.9
Total=	105	100.0

3.1.3 Occupation

The occupation of the respondents varied in distinct forms. Data presented in Fig. 2 shows that the majority percent of the respondents belong to 'agriculture' as their major occupation, some were engaged in other jobs and others were businessmen. The percentages of them were 61.9%, 34.3% and 3.8%, respectively. Most of the households of the study area are engaged in agricultural practices like crop farming, livestock rearing etc. They predominantly cultivate crops like maize, sweet gourds, onion, chili etc. in char lands which crops are grown well in that area.

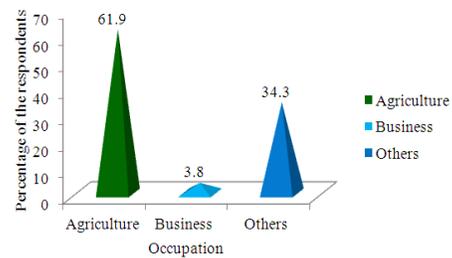


Fig. 2. Distribution of the respondents according to their occupation

3.2 Distribution of the Continuous Variables of the Respondents

3.2.1 Age

Age largely determines the aptitude to undertake responsibilities that require physical strength. Thus, it naturally classifies the society into elderly, middle and young, and also expects the continuation of generation. Result from Table 3 reflected that age of the respondents ranged from 20 to 70, the mean being 39.27 and more than half (56.2 percent) of the respondents were young aged where as 28.6 percent and only 15.2 percent of the respondents were fell middle and old aged category, respectively.

3.2.2 Educational qualification

Education enlightens the world and opens up the eyes of an individual to the realities of life beyond their perception. Educational qualification of the respondents ranged from 0.0 to 16, the mean being 3.73 and the standard deviation is 4.13. Analyzed data contained in Table 3 revealed that just more than half (52.4 percent) of the respondents can sign only,

Table 3. Salient features of the socio-economic characteristics of the respondents

Characteristics	Scoring method	Range		Categories	Respondents		Mean	SD
		Possible	Observed		No.	Percent		
Age	No. of year	Unknown	20-70	Young (18-35)	59	56.2	39.27	11.23
				Middle aged (36-50)	30	28.6		
				Old (≥ 51)	16	15.2		
Educational qualification	Year of schooling	Unknown	0.0-16	Illiterate (0)	3	2.8	3.73	4.13
				Can sign only (0.5)	55	52.4		
				Primary level (1-5)	13	12.4		
				Secondary level (6-10)	30	28.6		
				Above secondary level (≥ 11)	4	3.8		
Family size	No. of Members	Unknown	2-10	Small (≤ 4)	33	31.4	5.32	1.77
				Medium (5-6)	49	46.7		
				Large (>6)	23	21.9		
Annual family income	('000' Tk.)	Unknown	30.0-170.0	Low (≤ 37.0)	21	20.0	85.68	48.95
				Medium (37.01-122.0)	59	56.2		
				High (>122.0)	25	23.8		
Family expenditure	('000' Tk.)	Unknown	29.0-150.0	Low (≤ 32.0)	17	16.2	65.92	34.10
				Medium (32.01-100.0)	72	68.6		
				High (>100.0)	16	15.2		

28.6 percent were secondary educated, 12.4 percent were primary level educated, 3.8 percent were above secondary level educated and only 2.9 percent respondents were illiterate. These rural people face many challenges for their livelihood due to the live in char land. They were not conscious their education.

3.2.3 Family size

Table 3 depicted that the family size scores of the respondents ranged from 2 to 10. The average family size was 5.32 with a standard deviation of 1.77. Near about half of the respondents (46.7 percent) were belongs to medium family size while 31.4 percent had small and 21.9 percent had large family size. The national average family size in Bangladesh is 4.3 [15] which were below the mean value of the present study. It is quite logical that dominance of joint family system in the study area might have also contributed to the large family size.

3.2.4 Annual family income

Annual family income is the amount of income one family earn in one fiscal year when data were collected. Table 3 elucidates the annual family income of the respondents which ranged from 30.0 to 170.0, and the standard deviation is 48.95. It is evident that more than half of the respondents (56.2 percent) had medium annual family income that is 37 thousand to one lack twenty two thousand. The average annual family income was around 86 thousand taka which is half of the national per capita income of Tk. 1,74,888 in fiscal year 2019-2020 [16]. Therefore, it might be told that annual family income status in the study area is not so good.

3.2.5 Family expenditure

Results of Table 3 revealed that family expenditure of the respondents ranged from 29.0 to 150.0, the mean being 65.92 and the standard deviation is 34.10. A large majority (68.6 percent) of the respondents had medium family expenditure, 16.2 percent had low and 15.2 percent had high family expenditure.

3.3 Status of Bamboo Production

3.3.1 Land area for bamboo production

Data presented in Table 4 shown that the range of land area occupied by bamboo were 1 to 50 decimal at present (during study time) but 1 to 50 decimal before 5 years, 1 to 75 decimal before 10 years and 2 to 100 decimal before 15 years from the study duration. From the presented result in Table 3, it was observed that the mean at the present time is 6.65 but 5, 10 and 15 years ago it was 7.29, 8.84 and 11.88 decimal, respectively. This reflected that land area occupied by bamboo clump was gradually in decreasing trend.

The potential land area for bamboo production ranges from 0 to 10 decimal at present time, 0 to 50 decimal in before 5 years, 0 to 75 decimal in before 10 years and 0-100 decimal in before 15 years. Result presented in Table 4 revealed that the mean of available land area for bamboo cultivation were 2.39, but 5, 10 and 15 years ago it was 4.78, 4.18 and 5.03 decimal, respectively. Available land area for bamboo production was decreased about half compare to before five years.

Table 4. Land areas for bamboo production

Land occupied by bamboo clump (in decimal)			
Time	Minimum	Maximum	Mean
Present (during study time)	1	50	6.65
Before 5 years	1	50	7.29
Before 10 years	1	75	8.84
Before 15 years	2	100	11.88
Potential land area bamboo can be cultivated (in decimal)			
Present (during study time)	0	10	2.39
Before 5 years	0	50	4.78
Before 10 years	0	75	4.18
Before 15 years	0	100	5.03

Table 5. Number of bamboo clumps

Time	Minimum	Maximum	Mean	Total
Present	1	12	4.68	491
Before 5 years	0	16	5.13	539
Before 10 years	0	20	4.89	514
Before 15 years	0	20	5.09	635

Table 6. Distribution of the respondents according to the responses given on average height, average density and average diameter of the bamboo

Categories	Rural People	
	Number	%
Average height		
Very good	5	4.8
Good	78	74.2
Medium	22	21.0
Dwarf	0	0.0
Very dwarf	0	0.0
Average density		
Very good	3	2.9
Good	70	66.7
Medium	29	27.6
Bad	3	2.8
Very bad	0	0.0
Average diameter		
Very good	2	1.9
Good	65	61.9
Medium	33	31.4
Bad	5	4.8
Very bad	0	0.0

3.3.2 Bamboo clumps

Result in Table 5 showed that the range of the number of bamboo clumps is 1 to 12 in number at present time which was 0 to 16 in number before 5 years ago, 0 to 20 in number before 10 years ago and 0 to 20 in number before 15 years ago. Therefore, it might be told that some of the respondents had no bamboo clumps at least five years ago but now each and every respondent had minimum one bamboo clump though mean of bamboo clump is decreased.

The mean of the number of bamboo clump at present time is 4.68 which were 5.13, 4.89 and 5.09 before 5, 10 and 15 years ago, respectively. Total number of bamboo clumps decreased 22.68 percent in last 15 years and 7.56 percent bamboo clumps decreased in last five years.

3.3.3 Information about bamboo clump and individual bamboo

The information about bamboo and bamboo clump status includes average height, average

density and average diameter which were categorized as presented in Table 6 and respondents were given their responses based on their perception and experiences whether it would fall in which categories about height, density and diameter.

Results presented in Table 6 showed that near about three-fourths (74.3 percent) of the respondents opined that average height of the bamboo culms is good during study period which they responded as per their previous experience. About density in the bamboo clump majority of the respondent (66.7 percent) said that average density of the bamboo in the bamboo clump is good. In case of diameter of individual bamboo, most of the respondents (61.9 percent) opined that the average diameter is good.

3.3.4 Uses of bamboo

Usually bamboo is widely used for various purposes. In the study area, the respondents were used bamboo for housing, fence, fuel, furniture and preparation of handicrafts.

According to the following Fig. 3, among the respondents, 20 percent opined that they used bamboo for housing, where as 21 percent, 20 percents, 20 percent and 19 percent of the respondents responded that they used bamboo for fence, fuel, furniture and preparation of handicrafts, respectively. As per Alam [13] who revealed that bamboo is widely used in housing purpose as a building material. At present, bamboo is an extremely versatile material [17]. Apart from the use of shoots for food, the other bamboo organs can be used as follows: Culms: top parts (toothpicks, skewers, etc); middle upper parts (woven articles, handicrafts, bamboo curtains, laminated panels, etc); middle lower parts (laminated furniture, floorings); base parts (charcoal, bamboo vinegar); processing residue: energy; bamboo particleboard, bamboo viscose fiber textiles. Leaves: fodder, pigments, medicine, beverage, etc. Twigs: brooms. Rhizome: handicrafts [18]. Bamboo has two clearly differentiated uses in China: bamboo culms (for timber) and bamboo shoots (for food) [19]. Therefore, it is cleared from literature review and present study findings that bamboo can be used for versatile purposes.

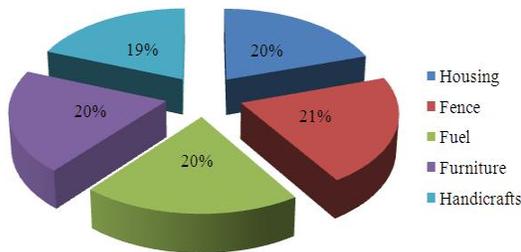


Fig. 3. Various uses of bamboo as per opinion of the respondents

3.3.5 Bamboo production cost

Though bamboo is growing naturally in the study area respondents need not to bear a

considerable amount of money for input costs. Therefore, they did not take it in their consideration therefore; no record is kept by them about their expenditure for bamboo production. Moreover, farmers or rural people do not use to use to keep any farm records in the study area. Therefore, perceptual opinion of the respondents about bamboo production costs is given in Table 7.

From the findings it's very clear that bamboo production cost in the study area is very low. The mean value 1366.47 Taka per year per household costs for bamboo production indicates that the production cost is really very negligible compare to output. It is also explored that more than three-fifths (63.8 percent) of the respondents expend above 500 taka for bamboo production as operational cost.

3.3.6 Perceived demand and production of bamboo

The following Table 8 illustrates the number and percentage of respondents in different demand and production categories during study periods.

In the study area present perceived demand of bamboo as opined by the majority of the respondents (65.7 percent) is very low. But the respondents added that the demand of bamboo for their personal household use is very low but market demand is very high as bamboo is used as the support for betel leaf production. Therefore, the bamboo produced in this area is transported to those areas where betel leaf is produced mostly like Rajshahi. As per opinion of the respondents regarding bamboo production majority (64.8 percent) of the respondents opined that the production of the bamboo is high but compare to previous production it's decreased which we got in number of bamboo clumps findings. But it's a matter of hope that as per the opinion of the respondents' bamboo production is increasing at a gradual rate and has already increased considerably in the study area.

Table 7. Operational costs (approximate in taka) for bamboo production in a year

Range		Categories	Frequency	Percent	Mean	SD
Min.	Max.					
0.0	2000.0	Up to 100 Tk.	17	16.2	1366.47	822.79
		101-500 Tk.	21	20.0		
		Above 500 Tk.	67	63.8		
Total=			105	100.0		

Table 8 . Distribution of the respondents according to overall perceived demand and production of bamboo during study time

Rural people		
Demand categories	Number	Percentage
No demand	13	12.4
Low	10	9.5
Very low	69	65.7
High	10	9.5
Very high	3	2.9
Total=	105	100.0
Production categories		
Low	11	10.4
Very low	17	16.2
High	68	64.8
Very high	9	8.6
Total=	105	100.0

3.3.7 Distribution of bamboo clump

When data were collected and went through the community it was observed that bamboo clumps were located here and there. In the study area, most of the bamboo clumps (65.0 percent) are located in near homestead, where as 25 percent in scattered way and 15 percent near pond side which is shown in the Fig. 4. Alam [13] conducted a research on status of bamboo production in Mymensingh district in 2009 and found that most of the bamboo gardens (65 percent) are located in scattered way and 18 percent near homesteads.

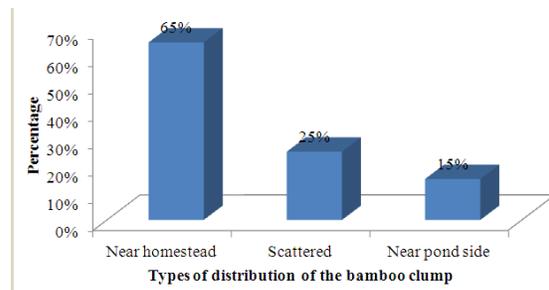


Fig. 4. Different types of distribution of bamboo clump

3.3.8 Pair wise ranking of bamboo species found in the study area

Ranking means placing something in order [20]. In pair wise ranking some species of bamboo grown in the study area of which people would like to know which one is mostly grown can be known. In a participatory research appraisal Focus Group Discussion of 15 people, name of the bamboo species written in separate cards

were placed to them in pairs in all possible combinations in a random way. The respondents would select one species over the other from each pair which they consider most useful, valuable and mostly grown. By this way ranking of a species was obtained. Their scores for individual species were summed up to get a composite ranking as Table 9. As per pair wise ranking *boro bash* was the first ranked species grown mostly in the study area. This might be due to that among the other species this one is larger, easily marketable, high valued, and strongest. Therefore, price is got more than the other varieties.

3.3.9 Bamboo based product or handicraft

Bamboo is used for the preparation of different household utensils. The purpose for the preparation of the bamboo based product is for own use but sometimes they sell it to the neighboring families because they are not the professional to making these. The people who made these products are locally known as *mohaly*, they were not the respondent for this study. The bamboo based product or handicraft are identified in the study area are shown in Table 10.

3.4 Knowledge Requirements for Increasing Bamboo Production

For doing anything it's necessary to have better knowledge on that issue. Likewise, the knowledge requirements for increasing bamboo production as per the opinion of the selected respondents are presented in Table 11.

Table 9. Ranking matrix of the bamboo species popularly grown in the study area

Bamboo species	1. Boro bash (B.balcooa)	2. Makla bash (B. nutans)	3. Jeota bash (Bambusa sp.)	4. Nol bash (Bambusa bambos)	5. Hari bash	6. Tarai bash (Melocanna baccifera)	Response Frequency	Rank Order
1. Boro bash (B.balcooa)							5	1 st
2. Makla bash (B. nutans)	1						4	2 nd
3. Jeota bash (Bambusa sp.)	1	2					3	3 rd
4. Nol bash (Bambusa bambos)	1	2	3				2	4 th
5. Hari bash	1	2	3	4			1	5 th
6. Tarai bash (Melocanna baccifera)	1	2	3	4	5		0	6 th

Table 10. Bamboo based products/handicraft prepared in the study area

Local name	Local name	Local name
Jharu	Macha	Mora
Rak	Khacha	Khopra
Dol	Kula	Duli
Jhuri	Pakha	Changari
Topa	Dali	Kabu
Jhapa	Dharai	Poloi
Tukri	Chatai	Fochka
Mora	Chalun	Hocha

Table 11. Number of citation of the respondents on knowledge requirement for increasing bamboo production

Sl. #	Types of knowledge	Number	Percentage
1.	Knowledge about better variety of bamboo	97	92.4
2.	Proper information about diseases of bamboo and their control measures	85	81.0
3.	Need training on bamboo production	83	79.0
4.	Proper information about doses of organic and chemical fertilizer	77	73.3
5.	Proper management of the soil	55	52.4
6.	Proper irrigation	52	49.5

Table 11 depicted that the foremost (92.4 percent) types of knowledge requirement for bamboo production was 'Knowledge about better variety of bamboo' as opined by the respondents during data collection. The reason behind making it first ranked by most of the respondents might be that if one know which variety would be profitable, demanded more and grown well with less effort then they would be benefitted more than the one who had no knowledge about this. Besides this, people think that they have a huge gap of knowledge about better variety of bamboo as most of them were not well educated. The lowest number (52) of respondents said that they need knowledge about proper irrigation method for bamboo cultivation. Usually bamboo needs not to be irrigated. Moreover, no special knowledge is required about irrigation in case of bamboo. Therefore, it is ranked last in the rank Table.

3.5 The Ways of Livelihood Improvement through Bamboo Production

The overall livelihood improvement of the respondents by bamboo production was found as depicted in Fig. 5.

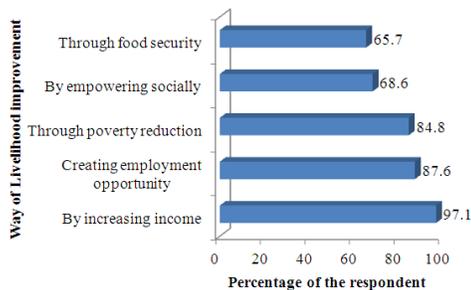


Fig. 5. Way of livelihood improvement through bamboo production

Fig. 5 revealed that livelihood of the target respondent is improved by the means of increasing income as responses given by the most of the respondents (97.1 percent) where as through contributing in the food security is the last means of livelihood improvement through bamboo production. The demand of bamboo is high and the cost of the production is less. They earn more income from bamboo cultivation. From the findings it is revealed that means of livelihood is considerably influenced by bamboo production. Therefore, it may be said that bamboo productions have an important role on the livelihood of the people in the study area.

According to Belcher [9] in India, it is estimated that there are two million traditional bamboo artisans. Their livelihoods depend almost entirely on the harvesting, processing and selling of bamboo and bamboo products such as baskets, mats and handicrafts. In China, there are millions of farmers who grow bamboo as a component in integrated farming systems. In other countries, the numbers are smaller; but wherever bamboo is found, there are people who depend on it, in whole or in part, for their livelihoods, and many of them are very poor.

Hogarth and Belcher [21] reported that bamboo income was predominantly derived from dried bamboo shoots cultivated in small-scale household plots, and was the single most valuable source of cash. It offers significant advantages to low-income rural communities with little access to investment capital or technology [19,22]. The achievements from the promising bamboo sector are remarkable. Economically, the high returns from the development of the sector have mainly accrued to rural areas. The sector has responded well to development planning: 'bamboo counties' which have diversified into developing different bamboo industries (furniture, flooring, shoots, charcoal and so on) have led to viable rural industries which have had important multiplier effects in raising local residents' incomes [23].

3.6 Causes of Decreasing the Bamboo Clumps

Fig. 6 depicts the causes mentioned by the respondents for decreasing the bamboo clumps.

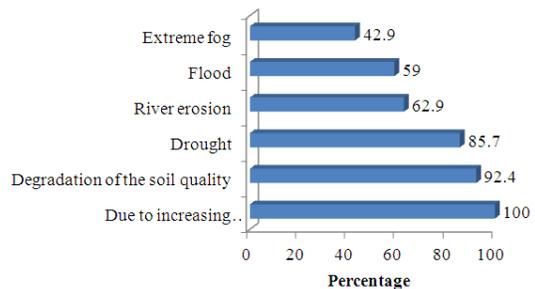


Fig. 6. Causes of decreasing the bamboo bushes as mentioned by the respondents

As per result shown in Fig. 6 all the respondents agreed and opined that 'Due to increasing residents/houses' bamboo bushes are decreased where as for extreme bad weather

Table 12. Suggestions opined by the respondents for increasing bamboo production

Sl. #	Suggestions	Number	Percentage
1.	Provide better varieties of bamboo	102	97.1
2.	Arrangement of training about bamboo production	96	91.4
3.	Increasing credit facilities	92	87.6
4.	Provide proper knowledge about disease management of bamboo	84	80.0
5.	Provide <i>khas</i> land for bamboo cultivation	71	67.6
6.	Provide irrigation facilities	68	64.8
7.	Increasing marketing facilities and ensure proper price	62	59.0

i.e. extreme fog is last cause for decreasing bamboo bushes as said by the respondent (42.9 percent). It is observed that due to increasing residents/houses bamboo production is declining as there is not enough places for all household to have a bamboo bush. Therefore, it can be said that population growth rate in the study area is a great threat for bamboo production. Alam [11] revealed that about 56 percent said the main cause of bamboo production decreasing is lack of land.

3.7 Suggestions for Increasing Bamboo Production

The suggestion which was given by the rural people for increasing the bamboo production is given in Table 12.

It is noted from the result in Table 12 that overwhelming majority of the respondents (97.1 percent) cited that 'Provide better varieties of bamboo' for increasing bamboo production. The reason might be that better variety will give better productions which ultimately increase total production of bamboo.

Whereas, 59.0 percent of the respondent opined that 'Increasing marketing facilities and ensure proper price' will increase bamboo production in the study area. This is due to that they have cultivated only local variety of bamboo. For very high production of bamboo they need better variety/hybrid variety of bamboo.

4. CONCLUSIONS

Based on findings the following conclusions might be drawn:

1. Bamboo productions are increasing at a gradual rate and if this rate remains stable hopefully would be increased considerably in the study area.
2. It is found that the knowledge requirement of the respondent for increasing bamboo

production is mostly on better variety of bamboo. Therefore, it might be concluded that they have a considerable gap of knowledge about variety of bamboo.

3. From the findings it is revealed that way of livelihood is considerably influenced through improving income by bamboo production. Therefore, it may be concluded that bamboo production have important role on the livelihood improvement of the people in the study area.
4. It is observed that due to increasing residents/houses bamboo production area is declining as there are not enough places for all household to have a bamboo clumps. Therefore, it might be concluded that population growth rate in the study area is a great threat for bamboo production.

5. RECOMMENDATIONS

Based on the conclusion the following recommendation can be given:

1. To improving, the holistic of bamboo using may provide a benefit to other agriculture section, their most occupation, in the area study. For example, the fertilizer production from bamboo leaf will provide a free organic fertilizer to the community. Indirect income will be return, as well.
2. The new products with high value relating the bamboo cultivars may be introduced to improve their income.
3. Mechanism for dissemination of bamboo production technologies and the benefit of circulation economic in bamboo subject should be provided to the study area in future.
4. Scientific management practices should be developed for naturally growing bamboos and plantation bamboos to improve productivity which ultimately increase income.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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