The Impact Of Private Bamboo Plantation Under TBM On The Socio-economic Development Of The Rural Livelihoods In The Mohanpur-Hezamara R.D Blocks, West Tripura.

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Abstract: TBM, the focal agency, that has and is undertaking large scale Bamboo plantation around the state of Tripura, with a goal to achieve 5000 ha of managed bamboo plantation over the 5 years and thus create a sustainable resource base. Bamboo can serve as an alternative form of livelihood to the farmers who are mostly dependent on paddy and rubber cultivation for a livelihood as well as play an important role in these regions where irrigation facilities are limited and the crops are rain-fed. In view of these details, this study analysed the effectiveness, sustainability and the future of bamboo plantation under TBM in Tripura. The R.D blocks of Mohanpur and Hezamara were selected for collecting data from the plantation areas and beneficiaries. Through this comprehensive assessment, this study have found out distinctive differences in landholding size, economic status, plantation viability, market responses and the improved socio-economic conditions of the farmers. This study also puts light on the price constraint face by the farmers in the market. A detailed analysis have also highlighted the necessity for cluster based development, the need for government support in planting and scientific and technical knowledge development as well as the zeal, enthusiasm, vision and incentive required by the farmer to successfully and effectively create a well-managed sustainable bamboo plantation.

Keywords: Bamboo plantation; alternative livelihood; sustainability; socio-economic conditions; cluster-based development.

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Introduction

Bamboo the fastest growing woody perennial on the planet, is highly versatile and is one of the most important multipurpose use species and is therefore introduced in various social forestry programmes in India .It is capable of growing in a variety of soils derived from different parent rocks, within its climatic habitats (Francis & Shanmughavel, 2008) Most bamboo species grow in the tropics; however, some varieties occur naturally in subtropical and temperate zones of all continents except Europe. The growing zone ranges from latitudes 46 °N to 47 °S and from sea level to over 13,000 feet (4,000 m) in elevation (Tripura Bamboo Mission, 2013).

Throughout the developing world, bamboo, once considered a subsistence resource is being converted into an industrialised cash commodity, with production of wide range of high value

products (Hogarth & Belcher, 2013). Thus, bamboo now is being recognised as a potential poverty alleviating resource in the developing world today (Obiri & Amoako, 2007). Owing to its multi-purpose ease of cultivation, nutritional abilities, easy to transport and process, inputs to soil protection and soil productivity enhancement, bamboo industry forms a huge scope for alleviating the rural economy and forming a sustainable livelihood to the ruralities. (Mishra, Giri, Panday, Kumar, & Bisht, 2014; Tripura Bamboo Mission, 2013) Several studies in Asia reveal that bamboo supports rural development, appeals to smallholder producers, and has several pro-poor characteristics. Moreover, bamboo has become a high-tech industrial raw material and substitute for wood with well-established markets and a wide range of production-to-consumption systems.(Endalamaw, Lindner, & Pretzsch, 2013) It has more than 1500 documented applications, ranging from medicine to nutrition and from toys to aircraft.(Ogunwusi & Onwualu, 2013)

Bamboo is an abundant resource found in the state of Tripura covering an area of 2397 km² and about 13 varieties of bamboo are found. Bamboo cultivation has a great potential for commercialization which can drive the rural development. Cane and Bamboo handicrafts of Tripura are acknowledged to be among the best in the country, due to their beauty, elegance. Bamboo industry is majorly small scale and cottage industries which were traditionally run by independent artisans. The contribution to state's economy as a result was very limited, though nearly 3 lakh people derive their livelihood from the bamboo sector. (Tripura Bamboo Mission, 2014) The rapid scale of deforestation, cutting of young bamboo shoots for food and large scale growth of muli species of bamboo has intensified the demand for non-muli bamboo species that are required for the handicraft, agarbatti and other bamboo related cottage industries. The rapid hike in price of bamboo poles 15-20% per year has posed a severe threat to the domestic bamboo industry. To meet the demand supply mismatch, there is a need for additional 5600 ha to be under plantation by 2017, that should include the right mix of bamboo species(Jenner & Reza, n.d.).

The Tripura Bamboo Mission implemented the bamboo plantation development project across the State in order to achieve 5000 ha of managed plantation over 5 year duration (as in Table 1). It is expected that the intervention will enable a shift from conventional cultivation practices for

ecology and forest restoration to commercial bamboo plantations with higher yield levels to meet the domestic and industrial requirement of the state (Tripura Bamboo Mission, 2014).

TABLE 2: Block-wise distribution of beneficiaries

Block	Village/GP	FY2010-11		FY2011 12		FY2012 13		FY2013 14		FY2014 -15		TOTAL	
		F	A	F	A	F	A	F	A	F	A	F	A
Mohanpur	Isanpur	33	12.21	-	-	-	-	66	23.2	-	-	99	35.41
	Bidyasagar	45	19.87	-	-	-	-	48	24	-	-	93	43.87
	Brahmakunda	31	22.76	-	-	-	-	35	11.76	-	-	66	34.52
	Mantala	1	0.48	-	-	-	-	114	24.64	-	-	115	25.12
Hezamara	Ramsankar					61	29.28					61	29.28
	Purba Simna					48	23.04					48	23.04
	SCPara			127	47.1							127	47.1
	Meglibond			36	17.1							36	17.1

| | Sankhala | | | | | | | 50 | 28.76 | | | 50 | 28.76 |
| | Balurbandh | | | | | | | 48 | 23.04 | | | 48 | 23.04 |

F= Farmers, A= Area in hectares

Materials and methods

3.1 Study Areas

This study has been conducted in two rural development blocks (R.D Blocks) of Mohanpur and Hezamara, West Tripura. The study falls in the geographic coordinates of 23∘57'55" and 24∘05'34" north latitude and 91∘17'18" and 91∘29'22" east longitude, having a highly humid climate and temperature ranging from 12˚C to 37˚C and also receives an average annual rainfall of 2400 mm (Tripura Bamboo Mission, 2013). The study area was chosen as the study is based on the selling cycle and these two R.D Blocks are traditionally growing bamboo in small scales in their wastelands and TBM have undertaken large scale bamboo plantations in private lands ranging from 0.12-12.5 acres in the study area from FY 2010-2011, FY 2011-2012 and FY 2013-2014.The total land area covered by TBM in these two R.D blocks is 307.24 Ha and it covers both agricultural and wastelands.

3.2 Data collection

Preliminary data collection method in the study was a structured questionnaire survey, where the beneficiary households were interviewed on the basis of a pre-developed questionnaire. Secondary data were later collected from the Tripura Bamboo Mission official website and inventories, Tripura Forest department and other websites related to the study. The data was collected in the months of January and February, 2016, just before their selling season of the year i.e., March-April, in order to get the standing stock for the present fiscal year.

The total beneficiaries from the two R.D blocks having 12 Gram Panchayats (as in table 2) were found to be 740 of which 20% of the beneficiaries were sampled using systematic sampling method (IIT Kharagpur, n.d.).

Village sample were taken using systematic method of sampling for which sampling interval was calculated as: K= N/n; where, K= sample interval, N= total population and n= sample population. First sample (n1) was taken randomly. The next sample was taken as n1+5. In my case the first sample was the first household from the list of ward office, second subsequently was 6 and similarly thereafter, results in total sample of 19 households from the first village. Following this method we landed up selecting 19 households from Vidyasagar GP, 23 households from Montala GP, 7 households from Simna GP, 7 households from Brahmakunda, 7 household from Meghliband, 27 household from SC Para, 20 household from Ramsankar Para 6 household from Balurbandh and 10 householod from Sankhala. Thus a total of 148 beneficiaries were selected for the interview.

3.3 Data analysis:

The data have been analysed using descriptive and inferential statistical tests in MS Excel. The contribution of bamboo income to household livelihoods and the associated socioeconomic factors were analysed using independent t-tests and correlation respectively, while correlation was used to analyse the relation between the survival rates of the two villages.
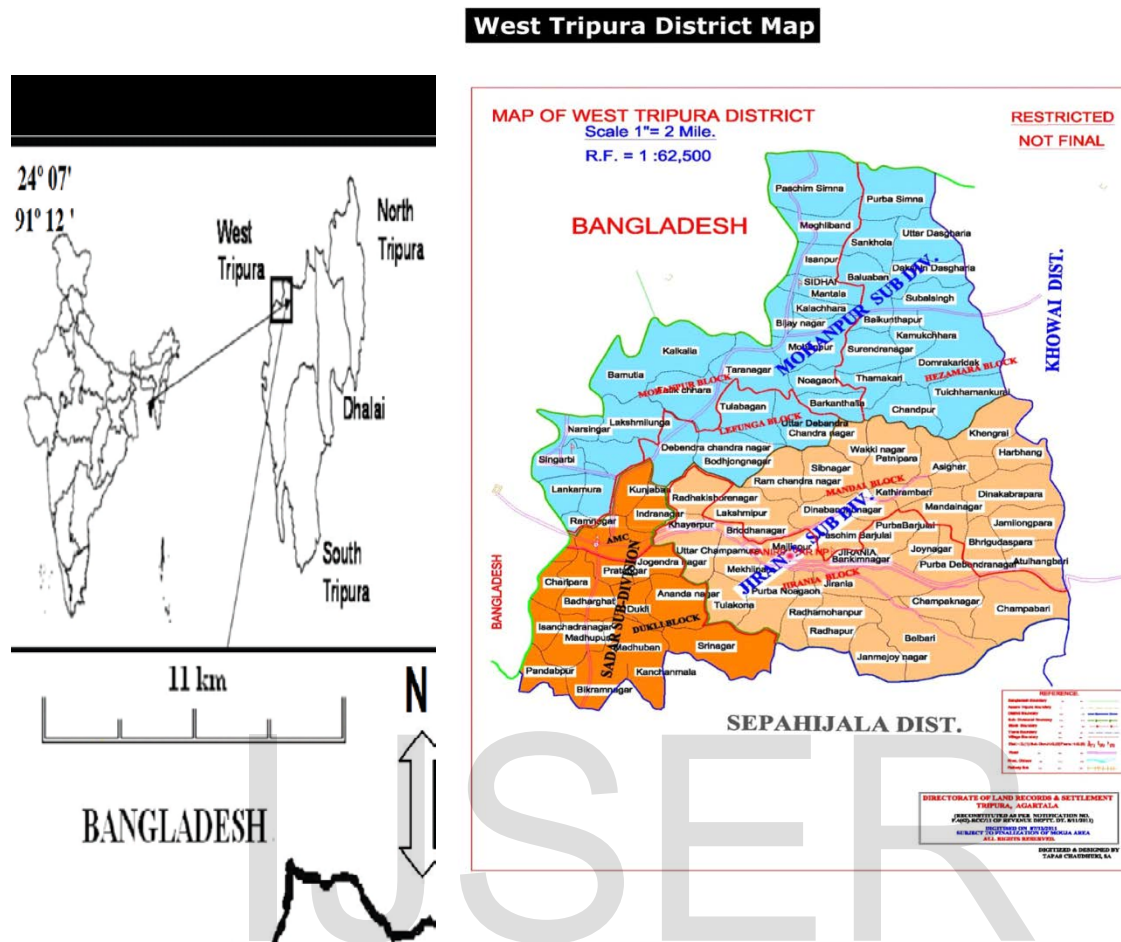
Fig 1.

The site of study in the map form

Source: http://horti.tripura.gov.in/PDF/District_profile/West.pdf

Results and discussion

Demographic Profile of the study area

4.1 *Age distribution*

It was found that 47.28% of the overall interviewees were of the age of 45 and below whereas 52.7% were of the age of above 45 years and 26.35% of the interviewees are above 55 years of age. Thus we can see that TBM has laid importance on the experienced and aged over

the youth. Also it has to be noted that, on having a glance blockwise, Mohanpur has 45.94% of the interviewees were below 45 years of age and 54.66% were above 45 years of age with 31.08% interviewees above 55 years of age, which indicates that more of the aged people take up plantation in the area. Whereas in Hezamara, 48.64% interviewees were below 45 years of age and 51.35% were above 45 years of age and 21.62% of the interviewees were above 55 years of age, which shows that there has been an almost equal distribution of age, and people of all ages are taking up bamboo plantation.

Table 3. Showing the distribution of various age groups of beneficiaries in the study area

age	Overall	Mohanpur	Hezamara
upto 25 years	3.37	4.05	2.70
25-35 years	21.62	24.32	18.92
35 - 45 years	22.29	17.57	27.02
45-55 years	26.35	22.97	29.73
55-65 years	15.54	17.57	13.51
> 65 years	10.81	13.51	8.11

4.2. Gender distribution

Gender distribution analysis shows majority of the beneficiaries (93.24%) of the beneficiaries were males whereas very less beneficiaries are females (6.7%). This gender inequality persists in the blockwise breakage in the similar pattern as is shown in the Table 2. But in the blocks the general distribution of males and females stand in the ratio of 1.009:1 whereas according to the survey the ratio of males to female beneficiaries from TBM stand at

13.81:1, which is far more lesser than the R.D Block average. Thus there's a need to lay more emphasis on female beneficiaries. (Disaster management Plan, 2014)

Table 4 Gender distribution of beneficiaries in the study area

sex	overall	mohanpur	Hezamara
male	93.24	93.24	93.24
female	6.75	6.75	6.75

4.3 Family Size of the beneficiaries

It has been observed that, 52.7% of the overall interviewed beneficiaries have a family size of 4 or less than 4 members. Thus most families do require additional labour for managing the plantation area and thus do require the additional mandays from the MGNREGA job cards. The trend remains more or less same in both the R.D blocks of Mohanpur and Hezamara.

Table 5 showing the family size variation of beneficiaries in the study area

No.of members	Overall	Mohanpur	Hezamara
< 4 members	52.70%	51.35%	54.05%
5-6 members	29.05%	29.72%	28.08%
>6 members	18.24%	18.91%	17.75%

4.4 Variation of the cast and religion of people in the area

All the beneficiaries who took part in the survey were Hindu in religion and no Muslim, Christian or Buddhist beneficiary were found.

The trend generally observed shows that the SC's and ST's are mostly the beneficiary farmers of bamboo accounting to over 53.06 % of the total beneficiaries interviewed. OBC's are next to follow with 23.3% and followed by general category people (UR). On breaking the report blockwise it has been seen that ST population dominates the Hezamara block (94.28%) with few general category (UR) beneficiaries but in the Hezamara block there are 99.22% of ST people present in the area. Thus we can see that TBM has put justifiable emphasis on the tribal in the area whereas at the same time did not compromise with the SC's or UR's in the area for providing the livelihood intervention. Whereas in Mohanpur, more of SC's and OBC's (42% and 34%) have been observed followed by UR and then ST's(5%), which is more or less similar to the average cast distribution in the R.D block of Mohanpur that has around 30% of SC's and around 9% of ST's. But there were no Religious minorities found during the process of the data collection.

4.5 RoFR land holders

Eighty-nine percentage of the beneficiaries do not have any RoFR landholding while 11% of the beneficiaries have RoFR landholdings in the study area. It has been seen that there were no RoFR landholders found in the Mohanpur R.D blocks but there were 31.42% of ROFR land holders in the Hezamara R.D block. Also notable here, that though the claim of TBM about reaching to benefit 85% of the total beneficiaries, it has been found that in the survey only 11% of the beneficiaries were having RoFR land only.

The distribution of RoFR land in Hezamara R.D block reveals that 29.4% of the farmers have 2 or less than 2 Ha of landholding area whereas only 2.8% of the people have more than 2 Ha of RoFR. The rest have reported no RoFR land. Also mostly the RoFR landholders mostly practice rubber plantation or Bamboo plantation in their ROFR land.

Graph 1 showing variation in RoFR landholding size in Hezamara R.D block

4.6 Type of farmers in the area of study and the area of land owned

It has been found that mostly the farmers are marginal farmers in the area with small landholding size (61.53%) with less than 1 Ha of cultivable land available for production whereas 39.47% have landholding size of above 1 Ha for production. But it has been seen that this overall pattern varies greatly in the blockwise landholding size distribution of the beneficiaries. At Hezamara, only 40% of the farmers have <1 Ha of cultivable land whereas 28.57% have an area of over 2 Ha for cultivation, but in Mohanpur, it has been seen that most farmers are marginal farmers (72.46%) while only 2.89% of the farmers have cultivable land of more than 2 Ha . Most farmers are marginal farmer found where 44.3% beneficiaries earn a living from agricultural activities while 26.01% beneficiaries are agri-labourers which forms the majority of sources of income for the beneficiaries, all though most of them (86.2%) have multiple sources of income. Monthly mean range of income for beneficiaries ranges from Rs. 3000- Rs. 7000. It has been found that in the study area the beneficiaries are mostly agri-farmers or agri-labourers, and they mostly derive their income from paddy, jute, rubber, bamboo and fruits and vegetable orchards. Also few others have small businesses or do govt. service or service at the nearest tea garden (graph 2). It has been observed that only 8.56% of the beneficiaries depend exclusively on agricultural income while the rest have multiple sources of income besides the income from MGNREGA.

Table 6 showing the landholding area distribution of the beneficiaries in study area

landholding/farmer size	overall %	Mohanpur %	Hezamara %
Marginal farmers, <1 ha	59.46	71.62	47.29
small farmer , 1-2 hectare	23.65	22.97	24.32
>2 hectare	16.89	5.4	28.37

The economic status analysis has showed us that TBM has put maximum emphasis on the upliftment of the poor as the beneficiaries economic survey mix exposes 57.69% beneficiaries

are BPL and 13.46% of beneficiaries are Antyodaya, which is higher than the control group where there were no antyodaya, 22% of BPL and rest were all APL.

Graph 2 showing the income sources of beneficiaries in %

Plantation and Livelihood contributions due to bamboo Plantations

4.7 Bamboo area and survival of the plantation

The plantation was carried out in 2010-2011, 2011-2012 and 2013-2014 in the study area. Over the two years and more it has been seen that 20.21% have no plantation area while the rest of the beneficiaries have plantation ranging from 0.16 Ha to 4 Ha individually. The variation in present and initial plantation area is represented in the graph (Graph 3) below:

Graph 3 showing initial and present status of bamboo plantation in the Mohanpur-Hezamara R.D block.

Table 7 showing the blockwise initial and final area under plantation of bamboo

Area of plantation	Mohanpur		Hezamara	
	Initial area	Final area	Initial area	Final area
No plantation	-	28.37	-	2.72
<2 kani	54.05	44.59	32.43	47.29
2-4 kani	31.08	16.21	47.29	21.62
4-6 kani	6.75	2.72	4.05	13.51
>6 kani	8.1	8.10	16.21	14.86

Notably during the course of survey, there were only 3 instances of no plantation found in the Hezamara R.D block out of 74 interviewees in S.C para and Meghlibond. But at Mohanpur, the failure to undertake plantation was majorly observed as about 30.43% of the interviewed

beneficiaries have reported negligible or no plantation at all. Mostly for this the reason as reported was delay in receiving the planting material as well as low quality of planting material in the Mohanpur area. But, through the interviews of the people in Hezamara, it was understood that although they have received similar planting material, and initial lower survival rate, it was also the lack of interest of the people and effort to survive the plantation that is also important for the survival of the plantation area.

It has been observed that out of the total number of farmers who have been supported by TBM for undertaking bamboo plantation either through MGNREGA or with other support, 69.12% of them have reported an increase in bamboo plantation area or maintained bamboo same area under bamboo plantation while 30.76% has reported a decrease of bamboo plantation area. But overall it was found that there was a net increase in the total area under plantation from 438.5 kani owned by beneficiaries interviewed to 518.9 kani. The major reasons for increase in bamboo growing area are continuous support of TBM in providing various schemes, beneficiaries' confidence in better market opportunities and availability of land for new bamboo plantation. The major reasons for decrease in area of around 30% of the farmers are lower survival of the plantation in the initial months of plantation and lack of subsequent effort by the farmers and unavailability of regular support from TBM after the first year.

Graph 4 showing overall increase or decrease in area in the study area.

But on breaking the result blockwise, we observe that Mohanpur records a 57.8% of the interviewed beneficiaries having either stagnant or increase in plantation area whereas a higher (42.02 %) decrease in their plantation area. The decrease is attributed to the lower survival rate of the rhizhomes and carelessness and attitude of the people. The increase is strongly related to availability of land and government support. But on an average Hezamara R.D block records mostly increase in plantation area or stagnant plantation area (92%) and very few people have (9%) reported a decrease in plantation area as shown in graph 8. Thus we can see a striking difference between the present plantation status of the bamboo farmers in the two areas. (*p*=0.035).

Now, moving on to the survival of the plantation, it was observed that the survival rate mostly depended on the type of rhizome and period of plantation. The people have complained about the delay in delivery of the rhizomes, which resulted in failure of plantation as they lack irrigation facilities and the fields are rain-fed. They have also cited the problem of carelessness among the vendors who deliver the planting materials, as many people had received 20-50% of defective rhizomes. Few have also objectified the persistence of theft, personal reluctance and lack of updated knowledge on bamboo plantation.

Graph 5 shows the variation of survival rates in the study area, from which we can see that hezamara has a higher survival rate compared to that of Mohanpur, and this can be the cause for increase in land area at Hezamara district.

Graph 5 showing the variation in survival % in the study area overall and blockwise

4.8 Previous Use:

In the area of study it has been observed that 76.92 % have used their wasteland area for cultivation whereas 23.08% were found to have converted their agricultural or other vegetation like teak/banana orchard into bamboo cultivation area, thus indicating to the maximum utilization of available land for economic activities due to the impetus of TBM. However there were no evidences of any beneficiary to have converted his/her land under rubber cultivation for growing bamboo. This pattern remains almost similar when broken area wise at Hezamara and Mohanpur R.D blocks separately.

Table 8 showing the overall and blockwise breakage of land conversion for bamboo plantation

previous land use	overall %	Mohanpur	Hezamara
Wasteland	75	81.08	68.91
Rubber	0	0	0
agricultural land	10.13	6.75	8.1
Others	14.86	12.16	22.97

It was observed in the survey that there were found 15 farmers in Mohanpur R.D block, out of 74 interviewed, who have converted their other vegetable plantations or agricultural land into bamboo cultivation area. Of them two of them were antyodaya. It was found that of the 15 farmers, 9 had a harvest history and the amount sold ranges from Rs. 300 to Rs. 59000 , with an average of Rs. 20866 per farmer and 11 of them have a survival rate of over 40% and 4 below 40%. Thus, we can see that most people have a trust on the long term benefits of bamboo and they dedicate their land on plantation of bamboo on their private lands, and it is evident from the harvest history that bamboo cultivation has now started to deliver its promises.

4.9 Species diversity

In the area, it has been observed that the most popular species here is Kanakaich, which has been planted all over the place. Exclusive kanakaich plantation leads the table by 69.44% which is followed b. Exclusive kanakaich plantation leads the table by 69.44% which is followed by muli that stands at 13.88% and then barak at 11.11%. it is quite interesting to find out that mritinga, the second largest growing variety has been given lower priority in the plantation of the bamboo cultivators under the aid of TBM. But when t-tests were done for finding any significant difference in the species diversity at Hezamara and Mohanpur, the difference was found to be statistically insignificant (p=0.56)

4.10 Income from bamboo sale

The bamboo as reported by the interviewees were sold form the FY 2012-2013 and in the last 3 years they could sale multiple times. In these 3 years, most farmers (45%) sold their harvest only once while the rest could sell the harvest multiple times. Also it has been observed that majority of the farmers in the area of study who have been interviewed 69.23% beneficiaries only sale bamboo poles and use the rhizomes for their own plantation area whereas the rest also have sold the rhizomes in the field at least once for additional profit. Thus we can also understand that the farmers have a localized approach of sustainability by which they use the rhizomes to fill up the existing gaps in the plantation, to sustain their plantation. Also the trend in sale of Bamboo rhizomes is that mostly they sale Bamboo rhizomes in alternate years.

Graph 6: showing variation in income from various source s before and after income from bamboo which is taken in the agriculture category while calculation.

It has been observed that the range of sales varied from Rs. 300 to Rs. 1,07,000 in the period of 3 years from the plantation. The mean income per farmer selling Bamboo was found to be Rs. 23,204.05 in 3 years (*S.E*=5539.25) considering he sales both rhizomes and bamboo. If we see block-wise we notice that in Mohanpur R.D block, 49%(n=36) could sell their harvest at a price ranging from Rs. 300 to Rs. 1,07,000 thus having an mean sale of Rs 19,875 per farmer in 3 years (*S.E*=10066.58, $t_{0.95=}$20061.66). But we can see a huge disparity in the price range of the farmers who are selling bamboo. It is also noted that most beneficiaries who have sold their bamboo in the Mohanpur area did not sell the rhizomes, and mostly are sellers who have sold mostly in the range 5000-12000. Whereas in Hezamara R.D block,71.42%(n=53) of the people could sell bamboo at a price ranging from Rs. 800 to Rs. 85000 in the 3 years through the sale of Bamboo poles and rhizomes. The average earnings that can be made through sales in these 3 years were calculated to be Rs. 26,532 (*S.E*=4684.57, $t_{0.95}$=9336.21) per farmer. Bamboo was expected to fetch an income of almost 1 lakh per annum per hectare, but we can see that the average income has been only Rs. 17,265.83 in 3 years.

Graph 7 Percentage of beneficiary population and their income range from bamboo sale

Graph 8 showing History and bamboo sale income yearwise

Table 9. showing History and bamboo sale income yearwise

Year	Sale amount in Rs.	Number of Sellers
2013-2014	92,000	17
2014-2015	7,38,000	67

2015-2016	17,45,000	92

4.11 Future plans for bamboo cultivation

It has been observed that majority of the people (44.43%) want to take up more land under cultivation while 32% people prefer to manage the existing land with better technology or application of fertilisers etc. least interest is shown in value addition to bamboo products (0.96%). Thus we can also note that the future of bamboo is quite bright as most beneficiaries who have more land available has mostly reported the urge to take more land under bamboo if necessary support is available through the government.

At hezamara, mostly beneficiaries are interested to take more land under cultivation (57.18%) and 37.5% wants to properly manage the land under plantation, with no instances of value addition or destroying the existing plantation and starting something else other than Bamboo. But when we have a glance into the conditions in Mohanpur , though there is a majority of people who wanted to take more land under cultivation or properly manage the land (38% and 30%) , but due to facing loss or inability to sell there are 14.08% farmers who wish to cut there bamboo plantation and switch to some other plantation.

Graph 9 showing future plans of beneficiary

The people who wants to cut all the bamboo and go for some other crops is mainly due to the low survival of the rhizhomes and the low price that bamboo fetches due to the market which is low for the cultivators. The cultivators in this group are marginal farmers with land area under bamboo <0.64 Ha, and of the 11, 7 of them have low survival of rhizhomes and 1 have reported

increase and two stagnant cultivated area. And only two of them could sell the produce at Rs.10000 and Rs.12000 in the last 3 years.

4.12 Selling models prevalent in the area

Around 11% of the farmers use the bamboo for their own consumption only and 23.52% of the farmers do only retail sell of bamboo from their garden. The other farmers mostly sell the bamboo to a buyer who pay the prevailing market price and cut the bamboo from the farmer's garden. One interesting observation is that there is no advance payment by the traders/buyers to the famer to purchase the bamboo on harvesting season. It is also observed that not a single respondent has bargained the price for the bamboo with the buyers over the last three years. The pattern stays similar in the entire study area with not much variation.

It is noted that those who sell locally have higher prices but they sell at a very low volume and thus, can't make up a total fortune through exclusive localized sell. The average sell for those selling locally is Rs. 1107 compared to the average of Rs. 23,944 in the mixed selling models.

4.13 Price of the bamboo and the market status

The market prices for the Kankaich bamboo has a range from Rs. 1.5 to 5 Rs per pole of less than 1 inch diameter, whereas for one to two inch diameter bamboo pole, the price of pole varies from Rs. 3 to Rs.17 and the price for bamboo pole of diameter more than 2 inch varies from Rs.3 to Rs.20. The reason for almost same price for 1-2 inch dia bamboo and >2 inch bamboo is due to monopsony behavior of the the buyers in the area who are mostly selling bamboo of 1-2 inch dia. The farmer, to get higher price for more than 2 inch dia bamboo, has to segregate the poles and look for such buyers who do not sell bamboo as pole or fishing rod. The upcoming furniture units who need thick bambo are ready to pay far better price for more than 2 inch dia kankaich bamboo. Also it should be pointed out that they mostly sell the bamboo which is <=2 years matured and mostly avoid keeping bamboo to obtain matured size that fetches higher price in the market.

Table 10 price of different types of bamboo in the study area

Particulars	<1 inch diameter			1-2 inch diameter			>2 inch diameter		
	1	2	3	1	2	3	1	2	3
Local sale	3-7	3-5	3-7	5-17	5-17	10-17	30-35	Not sold	30-35
Retail sale	1-5	1-2.5	2-5	2-7	2-5	7	18-25	Not sold	18-25

#1= overall #2= Mohanpur R.D block #3 = Hezamara R.D block

Thus from the above prices we can see that we can confer that Hezamara has an edge over Mohanpur in the market price, though mostly the buyers are same. Also we have noticed that the farmers in Hezamara start to sell from their plantation area as early as from the first year of plantation. They sell the fish rod size bamboo poles for the first year in certain amounts. But when analysed through statistical test (t-test), the differences were found to be statistically in significant. (p=0.514)

It is worth mentioning, that those who sell the bamboo at the higher than average price either sell in retail locally or have a cultivation area of more than 0.64 Ha of land under bamboo cultivation, thus they can sell at a higher quantity and thus can to a certain extent control the price.

When seen in the market status, we could actually gauge that the price of the bamboo received per pole is comparatively lower since the market is a monopsony, as there are a few buyers (only 3 or 4) and there are a lot of sellers. Therefore it is easier for the sellers to dictate their price for the bamboo poles on the small bamboo farmers, who actually end up being helpless as they need to sell and there is no demand for bamboo over 3 years of maturity as yet among the sellers.

4.14 Presence of social groups or SHG members in the beneficiaries.

Out of the total respondents 84.45% of the farmers are not part of any social group like SHG, ward-member, any other society, group etc where as 15.5% of the farmers are part of some social group like SHGs, societies, cooperatives etc. This may be one of the reasons for low price they are getting for their produce, bamboo.

Graph 10 Showing presence or absence of self-help groups

All the beneficiaries have agreed to the need of a bamboo cultivator's association in their Gram Panchayats so that they can get a better price and create a better market linkage while 24% of them have said that there is a need for bamboo growers association in the area so that it can help in technical assistance and labour shortages and other issues concerning the interests of the farmer.

Graph 11 showing the responded needs of the farmers for improvement in their bamboo market.

4.15 Social Impacts of Bamboo cultivation

It has been seen that there has been no occurrence of bank loans due to the bamboo plantation. All the beneficiaries have a savings bank account. They all have access to safe drinking water through tube-wells or supply water and water pumps. But they do not have any irrigation facilities to irrigate the land, and depend solely on rainwater. Also it has been found 73% of the beneficiaries have one or more children, and they can provide them education in school as well as facilitate them with all the basic amenities required for a family to live in which goes in line with the literacy of the block which stands at an average of 93% literacy rate, while they have 100% in the beneficiaries children.

Through our survey we also have seen that 72.11% could create an asset in the last 3 years while the rest couldn't create any such asset. These assets notably dint have any creating of gold ornaments and fixed deposit. Most people (47%) have bought or repaired land and bought animals and mobile phones. In Mohanpur, of the 74 people interviewed, 23 beneficiaries couldn't create any asset while the rest (69%) could buy something or the other in the past 3

years. Out of 74 beneficiaries interviewed, 56 could make a fortune or buy some asset over the past 3 years. Also 1 of the beneficiary has started a cooperative that sells finished Handicrafts products in the RD block. The cooperative have 17 members, of which we could capture 4 of them in our interview. They have reported that they have started production and are trying to be self-sufficent with orders from outside and government aid. They can be a potential buyer to the local market, which is their preference, where they are planning to pay higher price than the existing price in which bamboo is sold in the market.

CHAPTER FIVE

Conclusion

The bamboo villages that were identified in this study either had long established bamboo sectors (that began as small scale, traditional cottage industries but scaled up in recent years) with an established resource base and market chains; or, were the recent creations of the government funded bamboo based poverty alleviation project. Bamboo's contribution to household income and rural development is clearly important in the study area, both as a major source of cash income and for subsistence uses (for all sample households). It was found to change from a mean income of Rs. 82613.32(3 years back) to Rs. 91352.4 presently. Although MGNREGA and labour for agriculture contribute to 47% of the total income in the area of study, agricultural activities also is found to contribute to 35.6% to the net income in the study area. Sell of bamboo collectively (both as cash and subsistence income together) could contribute to 14.14% of the total income. It has been found that 68.91% (n=102) of the beneficiaries could sell their bamboo with mean income for each selling farmer being 33,668.63 per selling farmer in the study area. Though it is found that the mean income for farmers in Hezamara is higher than that of Mohanpur by Rs. 6,657, but the resultant difference was found out to be statistically insignificant(p=0.55). Although it was promised to yield an income of Rs. 100000 per year after the bamboo reaches a three year maturity, the average income per hectare was found out to be Rs. 49,037.58 per hectare in two years. It can be mostly due to the fact that most farmers cannot sell at the expected price of Rs. 25 per bamboo pole, as the ongoing market price is Rs. 5-7.5 per pole which almost accounts to Rs. 60,000 per hectare in two years on an average (1000*4*7.5). Thus in that way we can see that the beneficiaries selling bamboo in an average are performing in line with the expected performance and thus there is a better chance for progressing

economically and commercial bamboo is contributing to economic development of the farmers and thus in rural development.

Social development has also been observed as 100% of the farmer who have children less than 14 years, are sending them to school to pursue education. Also all of them have tubewell/handpumps/ municipal water supplies in their area as a source of water. 72.11% of the beneficiaries (n=107) could create an asset in the past 3 years and as well as create job opportunities as MGNREGA man days were provided through TBM for working in the bamboo cultivation as well as for fencing and digging and management of the cultivation (weeding, etc), as they provide income opportunities for themselves and other workers around them. Observations have also pointed out that there was no incidence of loan being taken for the purpose of bamboo cultivation, and 17.8% (n=26) of the beneficiaries have responded that they use their income from bamboo to repay the loans they have taken from local people or the bank. There haven't been any statistically significant differences between the mean incomes from bamboo for the two villages under the study.

The studies have revealed that there has been a negative correlation between plant planted per kani to the survival of the plants (r=-0.65). Thus we can conclude that it is not required to plant more plants to ensure higher survival rather it is better to plant optimum number of plants to fare better output in terms of survival of the plants in the cultivation area as it will reduce the competition for the nutrients and sunlight and water available to the land and since it is a rain-fed crop and the place do not have irrigation channels, it is required to plant optimum and not too many plants. Though there has been a disparity in plants planted per kani, but the mean plants/ kani is 975.34 ($t_{0.95}$=43.80) whereas it was supposed to be 1024 plants/ kani in the guideline. The overall survival rate in the field seems to show a mean survival of 56.23% ($t_{0.95}$=0.04, SE= 0.021) and thus we conclude that it was quite an effective plantation though the expected survival percentage was 75%. The histogram below shows the overall sustainability in the field.

Graph 12. Histogram showing the sustainability in the bamboo cultivation area.

The drawback was seen in small landholdings mostly (n=13) people having a land holding size of <2 kani, have reported a low survival of the <20% while only n=2 have reported a survival percentage of above 45% (having a landholding size less than 2 kani) and none above

60%.   Therefore it is important to provide the land to the beneficiaries judiciously. The plantation undertaken was effective as we can see that 44.43% farmers overall wanted to take up more land under cultivation area if government support is available and proper market linkages have maintained. Also it was seen that around 22.36% of the beneficiaries have taken land under bamboo aid twice in the FY 2011-2014, mostly being from the mohanpur area while in the hezamara area every year new plantation areas are being taken under plantation (55%). Thus the plantations under TBM have been quite effective in realising its goals, and with its proper market linkages and more attention will realise its goals in the future.

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