

## **Broom Grass As a Sustainable Source of Livelihood: An Empirical Study in West Karbi-Anglong district of Assam**

\*Rupjyoti Bordoloi, Department of Economics, Rabindranath Tagore University, Assam

\*\* Utpal Phukon, Department of Botany, Rabindranath Tagore University, Assam

### **Abstract**

In the present paper, we are exploring socio-economic condition of broom grass farmers and pattern of commercialization of the product in the West Karbi-Anglong district of Assam. The present study has based on the empirical data collected from sample farmers from the selected study area. Multiple regression model has been framed to analyse the factors effecting the marketed amount of broom grass among farmers. The study reveals that farmers are 70 percent farmers are below the poverty line and 54 percent of them are illiterate. Farmers are using firewood (75 percent) as a source of fuel and familiar with the tradition defecation system. The marketed amount of broom grass is positive and significantly influenced by average sell price, distance from the market center and educational attainment of the farmer. The average age and total land size of the farmer has negligible influence in the marketed amount of the product. Qualitative analysis reveals market of the product has been controlled by the middlemen traders from within and outside the district. Poor transportation and lack of sharing market related information become the serious constraints during marketing of the product.

**Key words:** Broom grass, Marketed amount, Market price, Multiple Regression.

**Introduction:** Nature has gifted various precious natural resources to the North Eastern states of India. The forest resource is one of the finest resources freely available in this region. The total recorded forest area in Assam is 26,836 square km. which is 34.21% of the total geographical area. (India State Forest Report, 2021) The quality of soil, rainfall, climate, geographical location all are in favour of the spontaneous growth of forest coverage. The forest resources have contributed large amount to the state economy. The revenue generated from forest resources was 451.49 crore during 2022-23, as compare to 401.20 crore during 2021-22. The contribution by Forestry and Logging sector toward GSDP 7,65,222 lakh in 2022-23 (QE) against 7,02,011 lakh in 2021-22 (PE) at current price registering a 9% growth. (Economic Survey report, 2023)

The forest coverage of an area is uneven in different parts of our state. Therefore to proper identification of a forest land, has been classified into four classes on the basis of the nature of forest coverage. Those are very dense forest, moderately dense forest, open forest and scrub. Classifications of forest land have been supported by a standard definition as mentioned in the table below.

Table 1. Classification of forest land area

S.N	Class of forest	Nature of forestry
1	Very dense forest	All lands with tree canopy density of 70 percent and above
2	Moderately dense forest	All lands with tree canopy density of 40 percent and more but less than 70 percent
3	Open forest	All lands with tree canopy density of 10 percent and more but less than 40 percent
4	Scrub	Forest land with canopy density less than 10 percent

Source: India State of Forest Report, 2021

Globally, more than one billion people depend directly on forests for their livelihoods and the remaining six billion depend on forests for a variety of economic, social and environmental benefits (Pandey et al. 2016). Non-timber forest products (NTFPs) are any product or service other than timber that is produced in forests include fruits and nuts, medicinal plants, resins, essences and a range of barks and fibers such as bamboo, rattans, and a host of other palms and grasses. (Kausik et al 2021) In India, Non Timber Forest Produce (NTFP) contributes an income equivalent to US\$ 2.7 billion per year and absorbs 55% of the total employment in the forestry sector. Moreover, 50% of forest revenues and 70% of forest-based export income come from such resources (Shiva and Verma, 2002; Chauhan et al., 2008).

Among the different forest resources we are considering ‘Broom Grass’ or tiger grass one of the Non Timber Forest Produce (NTFP) which has high market demand and value added quality. Brooms grass (*Thysanolaena maxima* Roxb: Poaceae) a tall, tufted, reed like perennial grass. (Alam et al. 2008) Its inflorescence is made into broom which is locally known as ‘Phooljhadu’. Generally, it grows in temperate and sub-tropical parts of India, Bhutan, Myanmar, China, East Asia, Nepal, New Guinea and Malaysia up to 2000 m (Watson and Dallwitz, 1992). The use and development of NTFPs is identified as one with the most important possible solutions to sustainable management of forests and uplifting the local economy (Wiersum and Ros-Tonen, 2005;). In India it is found abundantly in Assam, Arunachal Pradesh, Meghalaya, Mizoram, Tripura, Nagaland, Sikkim and some parts of West Bengal (Kaushik et al.) The product has been used in both domestic and industrial purposes. It has used in making of soft broom, paintbrush, bio fencing, wall building material, checking soil erosion, pulp and paper making. (Kaushik et al. 2014) The cultivation of broom grass has an advantage to cope soil erosion, sustain land management and can be used as a tool for reclamation of degraded land. (Bora, 2014)

This Non Timber Forest Resource (NTFR) is available in the river bank, slopes of hills and grazing land in Karbi-Anglong district of Assam. This product has used a raw material for production of Phooljhadu in Assamese and Bengali and it is Jhadughas, in Hindi (Kaushik et al. 2014). Its English name is broom grass/bouquet grass/tiger grass. It belongs to the family Poaceae (Alam et al. 2008). This product has national and international market. The brooms are exported in raw and unprocessed form to various parts of India. According to the traders operating from Guwahati, the brooms are also exported to other countries like Pakistan, the Middle East, and European countries such as France, Italy, and Germany (Hazarika, 2016). In each household day starts with sweeping and cleaning of floors by using this product.

Considering the economic importance of the product the North Eastern states of our country has started commercial cultivation of this product. Meghalaya roughly produces 30,000 metric tonnes of brooms, while Assam produces 20,000 metric tonnes. Nagaland produces 25,000 metric tonnes, Mizoram 15,000 metric tonnes, Arunachal Pradesh and Sikkim roughly accounts for 10,000 metric tonnes and 25,000 metric tonnes respectively. Mizoram made the first major broomsticks export when a consignment of 40,000 broomsticks was sent off to Russia in the early 2011.

Market players at different tiers are motivated by the goal of maximizing profits in their collection and sale of these products (Yadav & Misra, 2012). In the present paper we are focusing analyzing the socio-economic conditions of farmers involved in production of this highly demandable agro-based product. According to the report of NITI Ayog, Karbi-Anglong district is one of the most poorest and backward district of India. Besides having rich in natural resource, the district has received position among the top most backward district of our country. That reason is sufficient enough to attract the attention about the socio-economic condition of farmers of the selected non timber forest product and its cultivation as well as marketing process.

### **Objectives of the Study**

The present study has focused on the following points.

- a) To examine the socio-economic conditions of the Broom Grass farmers in the study area.
- b) To analyse the factors influencing the marketed amount of broom grass among the sample farmers.

### **District profile**

The undivided Karbi-Anglong district located at central part of Assam is the largest district in terms of geographical area. The land covers of the district is 10,434 sq. km (Rural: 10396.55 sq. km. and Urban: 37.45 sq. km.) out of the State total areas of 78,438 sq. km. (District Census Handbook, 2011) Karbi-Anglong is declared as a tribal area which came into being on 23<sup>rd</sup> June 1952. Under the 6th Scheduled of Constitution of India, the Mikir Hills now Karbi-Anglong

district rechristened as "Karbi- Anglong District" on 14<sup>th</sup> October'1976 with the status of an autonomous hills district head quarter at Diphu.

The forest coverage of the undivided district is the highest among the districts of Assam. It has forest coverage of 7,889.18 sq. km out of 10, 434 sq. km which is 75.61 of geographical area. The dense forest coverage area is 583.93 sq. km, 3, 538.63 sq. km is open forest and 84.38 sq. km has covered by scrub. (India State of Forest Report, 2019)

The present study area i.e. the West Karbi Anglong was created of the greater Karbi Anglong of Assam in the year 2016 with headquarter at Hamren. The district covers an area of 3068 sq. km with four development blocks and 547 inhabited villages. It has total population of 295358 comprising 151187 males and 144171 females. (Census, 2011) with density of 96 persons per sq. km. Rural and urban population is 277495 (94%) and 17863 (6%) respectively. In the district majority of the population are tribes. The major tribal ethnic groups of the district are Karbis, Tiwas, Dimasa, Bodos, Garos and so on. Besides non - tribal people also lives in the district. The economy is primarily agriculture based where more than 85% of the population depends on for their livelihood and the practice of Jhum cultivation is prevalent.

## **Review of Literature**

Kaushik et al (2014) has examined the socio economic conditions of broom grass cultivators of the northern region of Tripura. They analysed the Strength, Weakness, Opportunities and Threat involved in broom cultivation and its marketing in the locality. They have observed that the practice is broom cultivation is more viable (Benefit-Cost Ratio of 6.21) and sustainable. Deka et al (2017) have examined the socio-economic conditions of tribal farmers of Tinsukia district of Assam. It has observed that tribal farms are economically and socially backward in comparison to non-tribal farmers of the district. They used tabulation and percentage method for analysing the socio-economic status. Hazari et al (2023) have observed that for non-timber forest products (NTFPs) have playing an important role for improving rural income. They have found it is an important source of rural employment and livelihood. They have found forty-one non timber forest products in all over the country. It has observed thirteen different marketing channels are using to deliver products from the farmer to the final consumer. They used primary data based descriptive analysis. Ishizuka et al (2023) has examined the market chain of tiger grass products from Taunggya Village in the Southern Shan State based on an interview survey method. They observed that the value addition of tiger grass products between producers and traders increase by almost double at the grass processing stage and by 5–8 times at the broom manufacturing stage. They found that the exports of tiger grass (as raw material and broom products) drastically increased due to increasing demand for tiger grass.

## **Methodology**

This is one of the most important parts of any economic analysis. In the present study we are following the purposive sampling method, descriptive statistical analysis and simple econometric model for analyzing the information derived from the sample farmers.

### Selection of the study area

Our study has focused on the farmers socio-economic conditions and marketing of Tiger-Grass which has widely cultivated by the farmers of West Karbi-Anglong district of Assam. The district has a large land area covered with hills, plains and small mountains with beautiful natural scenery. That broom grass is suitable for cultivation in red, sandy and laterite types of soil which is available in the district. (NABARD, 2023) Broom grass is suitable for cultivation in slope of hills and small mountains and other high lands. The entire district is hilly and the topography of soil is suitable for germinating such broom grass. That reason has compelled us to consider this district as the study area. The district has divided into four political development blocks namely Rongkhag, Socheng, Amri, Chinthong. In our study we have considered equal importance on all the four development blocks. After the selection of the district, sample villages and farmers are selected in the following way.

### Selection of villages and Farmers household

West Karbi-Anglong district has formed with plain and hills. The district has four development blocks. At first stage in order to reflect the true picture of the reality we have covered the entire blocks of the district. In second stage we have purposively selected two villages on the basis of number of broom cultivators from each development blocks. Broom grass cultivation has practiced across the villages located both plains and foothills. But the intensity of broom cultivation is more among the hills areas of the district. Therefore sample villages and farmers are selected purposively from the foothills villages where cultivations are performed extensively. Finally sample farmers are selected on the basis of recommendation of the headman of the villages, recommendation of the government officials of development blocks. The entire sampling procedure is as follows.

Table 2: Classification of Villages and Farmers

Development Block	Name of the villages	Total no. of house holds	Selected farmers household	Total population of Sample villages	% of Sample Farmers
Rong Khang	Karbi Archan	42	03	87	14 %
	Umbormoni Karbi	45	09		
Chinthong	Zirikiding	38	08	78	15%
	Sarsing	40	04		
Amri	Rongching	32	04	66	18%
	Kuma Anglong	34	08		

Sochang	Birsinki	40	10	75	18%
	Long Eh Laboi	35	04		

Source: Authors Field Survey

### Data source and techniques

Authentic secondary data are not available about the production and marketing of broom grass in the district. The present study is entirely based on primary data collected from the sample farmers through using interview schedule. Farmers are living in very remote areas and familiar with their own local 'Karbi' language. To solve the language issue and clear understanding the problems of the cultivators the researcher has hired one bilingual speaker. To examine the standard of living of the sample farmers tabulation method has been used to represent the information.

### Marketed amount of Broom Grass

Marketed amount of broom grass has been estimated in the present analysis. There are various factors that influence the marketed amount of the product among the farmers. In order to determine the factors influencing the marketed amount or the actual selling amount of the product during the study period we have framed a multiple regression model. The regression model is as given below.

$$MABg = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \epsilon$$

Where, MABg = Marketed amount of Broom Grass is an endogenous variable.

$\alpha$  = Constant term and the exogenous variable are,  $X_1$  = average land area of broom cultivation (in acres),  $X_2$  = distance from the market place (in kilometers)  $X_3$  = average sell price of the product, (SP),  $X_4$  = educational qualification,  $X_5$  = age of the farmer,  $X_6$  = total agricultural land

### Analysis about the socio-economic status

In order to accomplish the first objective of the present study we have considered certain factors to determine the socio-economic positions of farmers in the district. The overall socio-economic position of the sample farmers are examined by considering certain factors that has truly reflected their positions. Those are mainly educational attainment level, source of drinking water, uses of fuel for domestic purpose and process of defecation etc.

It has been observed that 70 percent farmers are living below poverty and BPL card holder and 30 percent have APL Card holder. But the average size of the family is just 04 (four) which shows that the population size of the district is low. Therefore the average population density is the least among the district of the state. The sample household farmers are deprived of the proper power connection whereas the Karbi Langpi hydro power project with 100 MW is located within the

district. Thus the local indigenous people are deprived of the benefits from their own resources. This is one example of poverty and deprivation of the rural people. Our study has covered the standard of living of the people of the study area. It has observed that 90 percent house hold have kacha house made of threads, woods and bamboo. Such dwelling is itself sufficient enough to expose the poor standard of living of the people of the hill district.

Table 3: Socio economic status of farmers

S.N	Social Indicators	No of farmers
1	Religion of the farmer	38% are Hindu & 62% are Christian
2	Number of family size	Average family size is 4, adults 2 children,3
3	Agricultural land area	10% are large, 10% medium 80% small and farmer.
4	No of BPL Famers	70% farmers have BPL Card and 30% have APL Card
5	No of govt. employees	1% farmers have govt. job
6	Types of house	10% have semi-pucca house 90% have kacha house
7	Electricity facilities	29% household have without Electricity and 71% have electricity connection
8	Source of information	Radio set, relatives, agents
9	Educational attainment level	54% are illiterate 18% literate 10% have received education up-to class VIII 10% farmers have education level up-to HSLC 8% are highly educated
10	Sources of drinking water	10 % receives from Pond, 25% from River, 54% from Tube Well and 11% avail from Jal Jeevan Mission
11	Medical or Health card	24% have no Govt. Health Facilities 66% have covered under Health-Card Facilities
12	Having vehicle for	Bicycle and two wheelers among the respondent farmer

13	Types of defecation	29% have received under Swachh Bharat Mission (Gramin) 70% have Traditional Kaccha Latrin 1% have own Sanitary Facilities
14	Cooking fuel used	75 % used Firewood collected from forest, 25% LPG
15	Banking Facilities	46% banking facilities and 54% have no banking facilities
16	Types of agricultural product produced	Broom-grass, paddy, seasonal vegetables, ginger etc.

Source: author's field survey data

The educational attainment is one of the important factors that have determined the income, wealth and happiness of a farm family. It has been observed that 54 percent sample farmers are illiterate and 10 percent of them have qualified up to high school level and only 8 percent have higher than high school level. In the following table the socio-economic profile of the sample farmers are explained. Another important determinant of standard of living determination is the sources of drinking water. In our study it has observed that 35 percent house hold are using unhealthy and unhygienic source (Pond and River) of drinking water. Only 11 percent house hold has covered the Jaal Jeevan Mission during the study period. Another indicator of measuring quality of life is the use of fuel and defecation system. In our study it reveals that 75 percent respondent family has been using firewood as a source of cooking fuel. On the other hand, 29 percent have covered under Swachh Bharat Mission (Gramin) in the sample villages.

### **Method of cultivation and Marketing Procedure**

During the field survey it has observed that farmers are Broom Grass is cultivated similar to 'Jhum' type in the slopes of hills. At first they cut and burn the land area and after that planted the mother root (Rhizome) of the plant. Once it has planted it needs at least two to three years for being matured and it continues production for 10 to 15 years. One time cultivation gives benefits for long time period. Therefore farmers are very much interested to cultivate this product and have converted from other products like Ginger, Turmeric to Broom grass.

The plucking of steams and stalk started from January and it continues till the end of March or before starting the monsoon season. The best quality of Broom comes within the month of January and February. The quality of the product become deceases while the seeds come to the steams because that has reduced the longevity of the stalk.

Human energy has been used to cultivate and plucking process of the product. As it has observed that broom grass cultivation has been carried out in the slop of the hills and other high lands. Therefore it becomes more laborious to collect the stems from the farming sides to the home of the farmer. After plucking they kept it at certain place where shadow place because direct sunlight is harmful for the product.

### **Marketing procedure**

Marketing means any activity performed to provide the product from the producer hands to the final consumer. An ideal marketing system should be operate with maximum physical and allocative efficiency and prices throughout the marketing system must be efficient and must at the same time be equal to the marginal cost of production (Acharya et al. 2011). Brooms are uses in each house, therefore, it has large demand in the entire country. At international level, countries like South Korea, Pakistan, Saudi Arabia, Omen, Iran and other middle-east countries have high demand for the product. Because of the sustainability nature the product has wide and growing national market. The marketing procedure is quite different from other consumer goods because of durable nature of use of it. The product has to passed through different hands. Following channels of marketing the product have observed during the study.

The product at first collected from the field or foot hills area by the farmer himself or sometimes by using haired labour. After collection, they deposit it in some dark place or shadow places so as to protect from direct sunlight. The first stage of marketing started while the village trader or local trader visits farmer's house and collect it through offering certain price for the product.

Channel 1: Farmer --- Local Trader (Within district) ---- Outside trader (Other district) -----  
Outside state Agents -----Manufacturer .....Retailer .....Final Consumer

Channel 2: Farmer ---- Local Traders (Within district) --- Local Manufacturer ---  
Retailers.....Final Consumer

Channel 3: Farmer --- Outside trader (Other district) ---- Trader from outside states--- Outside  
Manufacture.....Retailer.....Final Consumer

Now in the second stage value addition started through after proper doing proper standardization of the product. Standardization or grading of the product has been done on the basis of the quality, size, colour, length and time of plucking of the stems. The best quality product comes during the month of December to January. It has high value in the market because of long lasting nature and green or blue colour of the product. The village trader or agents now ready to sale it in the hands of outside traders or big agents coming from outside the district. On basis of quality of the product it has to exported to those countries as mentioned earlier. Generally the best quality product has purchased by the big traders comes from Guwahati and Shillong (Meghalaya) and they sold it to the other traders located in outside the North East. Such product has moved to the Kolkota (West-Bengal) Jaipur (Rajasthan) and sometimes exported to other countries.

The medium grade product starts to enter in the local market from the month of February and March. It has good market demand locally and outside the district. It has circulated into different parts of our state and other states. In the end of market season (March to April) the third grade product becomes available in the market. It has demanded locally within the district and nearby town areas. Some local manufacturer has purchased it and made Broom to sell in the different district nearby market centers.

Price is determined by the traders cum agents based on the quality and availability of the product. In the early part of the season, product quality is best and the supply is limited so the price is in favour of the farmers. Thus the farmers are able to reap high price of the product in the early season. It has observed that the sale price of the product is different in different time period.

Table 4: Season wise Sale Price of Broom Grass (Amount in Rupees per Quintal)

S.n	Market season	Season time	Average Sale Price (3)	Maximum Price (1)	Minimum Price (2)	Price variations (1-2)=4
1	Peak season	December to January	7264	10000	4000	6000
2	Middle season	February to early March	5480	7000	3000	4000
3	End season	Mid of March to April	3670	5000	2000	3000

Source: Field survey data

As the peak season is the most suitable period for the farmers. Farmers are gaining more through disposing broom grass during the peak period. As the product quality is best and it has exported to other state or to outside the country. The average price variation during peak season is more that has influenced by the farmers location and bargaining power of the farmer. The very remote farmers have less bargaining power and high transportation cost. The price variation between middle and end of the season has decreases. The high price variations indicate more intermediations and high exploitation of farmer. Thus in the end of the season, product has demanded by locally so there is less intermediation that has indicates less price variations and low exploitation of farmer. So the in the end of the season market of broom grass is more efficient from the farmers point of view.

### Marketed Surplus analysis

As broom grass is a commercial product so whatever has produced is directly comes to the marketed as marketed surplus amount. The marketed amount of the product has influenced by number of factors. In our study we have considered average land area of broom cultivation (in

acres), distance from the market place (in kilometers) average sell price of the product, educational qualification, age of the farmer and total agricultural land. The rule of thumb for the Durbin Watson (DW) test is that the value ranges from 1.5 to 2.5 are relatively normal as there is no serial correlation among the independent variables. The Variance inflation factor (VIF) test results lies between 2 to 5 which indicates absence of multicollinearity among the explanatory variables. Thus we can consider to the use regression model as mentioned in the methodology part of the study.

Table 5: Regression Results Summary

Model Summary		
s.n.	R-square	0.873
1	Adjusted R-Square	0.855
2	Stan. Error	14.23
3	Durbin-Watson	2.11

Source: author's calculation using SPSS

Table 6: Regression Coefficient results of variables

s.n.	Name of the variables	Unstandardized B	Std. Error	T -Value	P- value
1	Constant	90.328	28.836	3.132	.003
2	Educational Qualification	4.848	1.701	2.849	.007
3	Land used for Broom Grass	8.381	1.237	6.774	.000
4	Average Sell Price	.015	.003	4.614	.000
5	Distance from Market Center	-.654	.189	-3.462	.001
6	Total Agricultural Land	.722	.541	1.335	.189
7	Age of the Farmer	.283	.276	1.023	.312

Source: Author's calculation using SPSS

We have observed that the marketed surplus is positively and significantly associated with the educational qualification, Land used for Broom Grass, average sell price are positive and significantly influence the marketed amount of the product. The marketed amount has increased with increase in sell price. Farmers are observing about the market price of the product. During our field survey it has found that the broom cultivation has expanded and it has reduced the size of land used for other horticultural products like ginger, turmeric and even reduced the traditional

shifting cultivation in the district. Education has a positive and significant impact on the marketed amount of the product. The highly educated farmers are more aware about the greater demand for the product and designed farming products accordingly. Educational qualifications have helped to access more information about the product, market and its demand. So the educated farmers though it is very small in numbers but they are earning better price of their product by producing best quality broom (blue colour) and selling them during peak market season.

Distance from the market center is negative and significant as the distance increases marketed amount has decreased. It shows during our field survey that the road communication is very difficult due the high altitude and hilly road. So the farmers from the very remotes villages are less interested to marketed their surplus amount at reasonable price. This has created an opportunity for the intermediaries (village traders) to bargain with the farmer at low price. The mean age of the farmer and the total agricultural land has insignificant in explaining the marketed amount. The broom cultivation is possible only in hilly terrain areas. Thus becoming a large farmer having large agricultural land does not directly influence in marketed amount of broom.

### **Conclusion:**

The socio economic conditions of the farmers are more backward and matter of serious concern. People are deprived of various basic amenities of life that has pushed the district to become among the most backward districts of our country. The inadequate training about marketing of the finished product has resulted poor earning from the agriculture sector. The road communication with the broom production areas are difficult and have poor connectivity with the people living in plain areas. There is language gap of the farmers while dealing with the majority population. Farmers are not familiar with neither Hindi nor the regional language (Assamese) except their own Karbi language. That has decrease the marketing efficiency among them. As the proper communication skill enhanced the bargaining capacity of the farmers resides in the hill and remote places. It has no doubt that broom grass has a great future potential forest resource of the district. It has played a great role for improving the farmer's economic condition. The agriculture marketing board has to play a dynamic role for improving marketing and capturing more markets will enhance the overall economic well-being of the people. Farmers have enough agriculture land area specially hill slopes, and foot hills, but the lack of proper training about efficient method of cultivation has reduced the timely supply of the product. Thus government intervention in both cultivation and marketing will ensure better economic life of the farmers.

### **References**

Alam, M. J. Ali M. R., Sarmin, N. S. Miah M. M. U. and Shahjahan M. (2008). "Existing marketing system and economic analysis of Broom grass (*Thysanolaena maxima* Roxb: Poaceae)", *Journal of Agroforestry and Environment* 2 (2): 9-13, 2008 ISSN 1995-6983

Bhuchar, S. K. (2001). An Eco-Physiological Evaluation of *Thysanolaena maxima* (Broom Grass): a Multipurpose Perennial Grass of High Fodder Value (Ph. D thesis). Kumaun University, Nainital, India

Bisht, N. S. & Ahlawat S. P. (1998). “Broom Grass – SFRI Information Bulletin No. 6, State Forest Research Institute”, Itanagar (AP, INDIA).

Borah, I. P. (2012). Project Completion Report on “Improvement of degraded shifting cultivation lands through introduction of *Thysanolaena maxima* (Broom grass) along with *Cajanus cajan* as N<sub>2</sub> fixing plant” submitted to ICFRE *Manjari*, Vol 1. Issu. 1. NTPC Centre of Excellence, Tripura

Chubakumzuk Jamir & Yanyak. (2022). Economic Return from *Thysanolaena maxima* (Roxb) Kuntze (Broom Grass) Cultivation in Nian Village, Longleng, Nagaland, India, International Journal of Business, Technology, and Organizational Behavior (IJBTOB) ISSN: 2775-4936 Vol. 2 No. 1,

Deka. S., Nath. R.K., Sehgal. M., Borbora. A.C., Kakati. R.K., Ahuja. D.B. (2017). “Socio-Economic Status of Tribal Farmers of Tinsukia District of Assam: A Case Study” International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Vol. 6 No.9 Pp. 2244-2248 <http://www.ijcmas.com>

Hazarika R. (2016). “Broom grass: A potential livelihood generation source”, *Field Forester*, Directorate of Forest Education, Ministry of Environment, Forests & Climate Change, Government of India, June, 2016

Hazari. S., Kolita, M., Lahiri. B. (2023). “The Value of Non-Timber Forest Products (NTFPs) in Promoting India’s rural livelihoods” Indonesian Journal of Forestry Research Vol. 10 No. 2, Pp 221-237

Ishizuka. M., Toda. M., Kuramoto. J., Aun. Y., Shr. P.P.K., Shin. T. (2023). “Domestic and export markets for Myanmar tiger grass brooms: A case study of Taunggya Village, Shan State,” TROPICS Vol. 31 (4) Pp 135-145

India State of Forest Report, (2019). Forest Survey of India, Ministry of Environment, Forest & Climate Change, Government of India, Pp-23

Kumar, D. K., Rao, J. V. and Dart, P.J. (1987). “Nodulation, nitrogen fixation and nitrogen uptake in pigeonpea (*Cajanus cajan* (L.) Millsp) of different maturity groups, Plant and Soil,” 99 (2-3). pp. 255-266. 5. *NCE Internal Report* (2013). NTFP Centre of Excellence, Tripura – JICA Project, Agartala

Kaushik P. K. and Nandini D. (2014). “A Viable Model for Broom Grass Cultivation and Management in Tripura”, *Review of Research*, Vol. 3 Issue 4 ISSN:-2249-894X

Kaushik. P. K. and Kumar. S. (2014). “Broom Grass – the Wonder Plant at a Glance”, *Manjari*, Vol 1.Issu 1. NTPC Centre of Excellence, Tripura

Mukul, S.A. Uddin, M. B. Manzoor Rashid, A. Z. M. and Fox, J. (2010), “Integrating livelihoods and conservation in protected areas: understanding the role and stakeholder views on prospects for non-timber forest products, a Bangladesh case study”. *International Journal of Sustainable Development & World Ecology*, 17(2): 180-188. DOI: <https://doi.org/10.1080/13504500903549676>

National Bank for Agriculture and Rural Development (2023-24). “Potential Linked Credit Plan - West Karbi Anglong district” Assam Regional Office G. S. Road, Dispur, Guwahati - 781 006

Pandey, A.K., Tripathi, Y.C. and Kumar, A. (2016). “Non Timber Forest Products (NTFPs) for Sustained Livelihood: Challenges and Strategies”. *Research Journal of Forestry*,10(1):1-7.

Shiva, M. P. and S. K. Verma, (2002). “Approaches to sustainable forest management and biodiversity conservation: With pivotal role of non timber forest products” . Centre for Minor Forest Products, Valley Offset Printers, Dehradun.

Chubakumzuk Jamir & Yanyak. (2022), Economic Return from *Thysanolaena maxima* (Roxb) Kuntze (Broom Grass) Cultivation in Nian Village, Longleng, Nagaland, India, *International Journal of Business, Technology, and Organizational Behavior (IJBTOB)* ISSN: 2775-4936 Vol. 2 No. 1,

Yadav, M., & Misra, S. (2012). “Sustainable development: a role for market information systems for non-timber forest products”. *Sustainable Development*, 20(2), 128–140. doi://10.1002/sd.470.

Wiersum, K.F. and Ros-Tonen, M.A. (2005). “The role of forests in poverty alleviation: Dealing with multiple millennium development goals.” North-South Policy Brief, 6: 1-7. Available online: <https://library.wur.nl/WebQuery/wurpubs/fulltext/29448> [Accessed on 5 December 2020].