INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS & MANAGEMENT

IJRCM

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HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

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CONTRIBUTIONS TO BOOKS

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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BAMBOO CULTIVATION IN DIMAPUR, NAGALAND – GROWERS PERCEPTION

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ABSTRACT

To understand the potential of bamboo cultivation in Dimapur district, Nagaland a study was carried out in six major bamboo cultivating villages in the month May-July 2012 with objectives to identify the reason for cultivating bamboo and to identify the problems faced in the bamboo cultivation. Though there are 22 species of bamboo available in Nagaland, three species of bamboo namely Kako (Dendrocalamus damiltonii), Dolo (Teinostachyum dulla) and Jati (Bambusa tulda) were cultivated by most of the villagers. The main reasons for preferring cultivation of bamboo are high profit making opportunity, suitability of soil and favorable climatic condition. Though insects like beetles and termites were found the most commonly occurred insects attacking bamboo, the harvest of bamboo per hectare was 15 tons in an average. Another problem faced by the farmers in bamboo cultivation is lack of scientific knowledge in plantation. Scientific plantation of bamboo with specified spacing between saplings should be adopted and cultivated while management of clump forming bamboo should be utilizing while cultivation bamboo. Bamboo, initially being regarded as a poor man's timber has now been transformed into "green gold" because of its potential to provide ecological and economic benefits to the people. It continues to play a predominant role in the life of the rural people even today in every walk of life that ranges from agricultural tools and implements to shelter, food and livelihood. This prompted the researcher to write this paper by echoing horse mouth.

KEYWORDS
M00 Bamboo cultivation, growers, Nagaland, problems, reasons.

1. INTRODUCTION

Bamboo is a woody grass belonging to the sub family Bambusoideae of the family Poaceae. Bamboo is fast growing species and therefore, known as "**Green Gold**". This green gold is sufficiently cheap and plentiful to meet the vast needs of human populace from the "*child cradle to the dead man's bier*" that is why sometimes known as "*poor man's timber*". India is very rich in bamboo diversity. There are 124 indigenous and exotic species under 23 genera found naturally and under cultivation in India. An estimated 8.6 million ha forest area of the country contains bamboo (**Ram, et al, 2010**). India is the second largest producer of bamboo in the world next to China and also has the rich diversity of bamboos. Out of 78 species of bamboos distributed in the North East India (**AJ Nath, et al, 2009**), 22 major species are found in Nagaland. Two-thirds of the bamboo in the country is restricted to theNorth-Eastern Region (NER) while the remaining one-third is spread across the country. Bamboo is found extensively in Nagaland. It occurs as a predominant grass in parts of the districts of Dimapur, Peren, Mon and Mokokchung; it is found mixed with other forest species in all other districts. This paper gives a vivid account of bamboo cultivation process and problems relating to it.

USES OF BAMBOO

It is mostly used in pulp and paper industries, domestic and cottage industries etc. Bamboo is considered to be multipurpose plant with varieties of different uses such as medicine, food and fodder, construction, handicraft and furniture, paper and pulp, preventing soil erosion etc. and is one of the world's best engineering materials because of its high tensile strength (**Arvin Kumar Goyal, et al, 2012**). The rural people of Nagaland in particular are dependent on bamboo for their construction and agricultural implements. The plant has a fast growing rate, a high strength and stiffness, can easily be used in many manufacturing process and is available on many locations (**Zhi-Ming Liu, 2011**). Bamboostands maturity within 3 years in controlled forests. The plant is considered as a short-term renewable resources, which has environmental advantages over long-cycle renewable resources extraction (**Scurlock, 2000***).*Bamboo is also used to make a different variety of household goods viz., furniture, dinnerware, sporting goods, jewelry and handbags comprised of it. It has also been used for flooring, cutting boards, and many other good that is commonly made of wood.

BAMBOO CULTIVATION

About 5% of the growing stock of bamboo of the country is in Nagaland which is about 4, 48,000 hectares. The dominant species in Nagaland are Kako (Dendrocalamushamiltonii), Dolo (Teinostachyumdulloa) and Jati (Bambusatulda).They occur all along thelower belts in the border with Assam. While Kakoo and Daloo clumps are characterized in moist localities along the nalas and streams, Jati occupies better-drained sites. In more accessible localities along the roads bamboos have been over cut while, in other areas they have been left untouched for many years.

TABLE 1. LIST OF THE DISTRICTS AND TOWN WITH DETAILS OF CULTIVATE BAMBOO LAND IN THE STATE DURING THE YEAR 2007-2010

Sl. No.	Districts/Town	2007 Ha.	2008 Ha.	2009 Ha.	2010 Ha.	Total Ha.
1	Dimapur	350	600	210	210	**1370**
2	Kiphire	250	390	210	150	**1000**
3	Kohima	300	600	215	150	**1265**
4	Longleng	280	400	180	270	**1130**
5	Mokokchung	Nil	500	250	500	**1250**
6	Mon	262	550	80	250	**1142**
7	Peren	250	400	210	150	**1010**
8	Phek	230	620	210	150	**1210**
9	Tuensang	350	500	180	150	**1180**
10	Tuli	1000	500	400	700	**2600**
11	Wokha	250	450	210	270	**1180**
12	Zunheboto	250	450	210	150	**1060**
	Total (Ha.)	**3772**	**5960**	**2565**	**3100**	**15397**

Source: *Nagaland Bamboo Development Agency, Dimapur*.

2. STUDY OBJECTIVES

The study was carried out with the following objectives:

1) To identify the reasons for cultivating bamboo.
2) To identify the problems faced in the bamboo cultivation

3. MATERIALS AND METHODS

It is an empirical research based on survey method. The study was conducted from May to July 2012 in Dimapur district of Nagaland. The sample of 104 households of bamboo cultivators was selected from the 6 villages out of 43 available villages cultivating bamboo within the Dimapur district. The sample farmers were selected from the following villages namely; Homeland, Zhuheshe, Ghotovi, Phushito, Nihoi and Bade where the cultivation was higher compared to other available villages. Information regarding different species of bamboo cultivations, reason for cultivating bamboo and the problems faced in bamboo cultivation were all gathered from field visits and interaction with bamboo cultivators through detailed and structured questionnaire. Friedman Test and Wilcoxon Signed-Rank Test were used to identify the objectives.Secondary data were also gathered from relevant articles, reports and documents.

4. GREEN GOLD IN DIMAPUR (STUDY AREA)

The focus of this study is Dimapur district also known as Brick city by the European scholar and Ahoms, situated on the banks of the River Dhansiri. It is one of the largest bamboo raw material production areas in the state. The district is 4,300 ha, with a bamboo cultivated area of 1,370 ha. A large area of the district is in the plains with an average elevation of 260 m above sea level excepting the Medziphema sub-division and few villages of Niuland sub-division, which are located in the foothills. Dimapur, situated at 25° 54' 45'' N Latitude and 93° 44' 30'' E Longitude. Climate is hot and humid in the plains during summer (reaching a maximum of 36ºC, with humidity upto 93%) while the winter months are cool and pleasant. The average annual rainfall is 1504.7 mm

Dimapur in Nagaland is bounded by Kohima district on the south and east, KarbiAnglong district of Assam on the west, the KarbiAnglong and stretch of Golaghat District of Assam in the west and the south. It is an important trade and commercial center. Besides being referred to as a gateway of Nagaland and Manipur, main commercial activities of the state, is centered on Dimapur.

TABLE 2: LIST OF BAMBOO CULTIVATING VILLAGES IN DIMAPUR DISTRICT

Sl. No.	Name of the village	2007 (Ha.)	2008 (Ha.)	2009 (Ha.)	2010 (Ha.)	Total (Ha.)
1	Homeland	180	60	25	35	**300**
2	United Village	5				**5**
3	Piphema	2				**2**
4	Ganeshnagar	10				**10**
5	Kashiram	10				**10**
6	Showoba	12				**12**
7	Chumukedima	25				**25**
8	Lotavi	17				**17**
9	Keyezu	5				**5**
10	Padumpukhuri	10				**10**
11	Zhuheshe		80	30	25	**135**
12	Ghotovi	36	50	20	25	**131**
13	Vihokhu		20	10		**30**
14	Sethekima Old		20			**20**
15	New Chumukedima	5	20			**25**
16	Razaphema		20			**20**
17	Phushito	33	40	30	15	**118**
18	Shikavi		15			**15**
19	Murise		10			**10**
20	Khehoi		15			**15**
21	Ghokuto		20			**20**
22	Zutovi/Pinla		15			**15**
23	Nihoi		15		30	**45**
24	Phuhoto		15	10		**25**
25	Khehokhu		25			**25**
26	Bade		15	10	12	**37**
27	Luhevi		20			**20**
28	Sahoi		35			**35**
29	Lohozhe		15			**15**
30	Hovukhu		15			**15**
31	Ghokito		20			**20**
32	Videma		10	5		**15**
33	Tsiepama		10			**10**
34	Aoyimkum		20			**20**
35	Hevishe			30	5	**35**
36	Zukihe			10		**10**
37	Zhuikhu			20	5	**25**
38	Setrongse			10		**10**
39	Khekiho				5	**5**
40	Suhoi				5	**5**
41	Khughovi				5	**5**
42	Kakiho				20	**20**
43	Medziphema				8	**8**
	Total	**350**	**600**	**210**	**210**	**1370**

Source: *Nagaland Bamboo Development Agency, Dimapur*

5. BAMBOO PLANTATION DEVELOPMENT IN NAGALAND

Nagaland with 89% of its total geographical area under the ownership of private individuals and communities offers a unique scope for raising bamboo plantation. Plantation is promoted on individual landholdings as well as community lands.

TABLE 3: PHYSICAL AND FINANCIAL PROGRESS REPORT FOR NATIONAL BAMBOO MISSION (NBM) FUNDED ACTIVITIES FROM THE YEAR 2007-08 & 2008-09

Work plan under NBM		**2007-2008**		**2008-2009**	
Sl. No.	Particulars	Unit	Amount (in Lacs)	Unit	Amount (in Lacs)
1	Bamboo Plantation	3892 Ha	973.00	7500 Ha	1875.00
2	Nursery				
	I. Central Public Nursery	6 Nos	2.50	5 Nos	2.50
	II. Central Private Nursery	10 Nos	0.68	8 Nos	0.68
	III. Kisan Nursery	10 Nos	0.06	16 Nos	0.06
	IV. Mahila Nursery	10 Nos	0.06	16 Nos	0.06
3	Existing Stock Management	3237 Ha	122.96	2500 Ha	122.96
4	Pest and Disease Management	1750 Ha	12.00	6000 Ha	12.00
5	Post-Harvest treatment	2 Nos	40.00	2 Nos	40.00
6	Wholesale/Retail Outlet	3 Nos	15.99	3 Nos	15.99
7	Bamboo Bazaar	2 Nos	18.00	2 Nos	18.00
	Total		**1185.25**		**2087.25**

Source: *Nagaland Bamboo Development Agency, Dimapur*.

The Nagaland Bamboo Development Agency (NBDA) has implemented the National Bamboo Mission (NBM) Programme by undertaking bamboo plantation of selected commercially viable bamboo species with appropriate species-site match that is suitable to the agro climatic condition prevalent in the state. So far, the Agency has covered 13,982 hectares of bamboo plantation against the target of 50,000 hectares.

The Agency facilitates availability of quality saplings required for the plantation and also undertakes regeneration through scientific management practices focusing on cluster based compact areas. A total of 81 nurseries, both Central and Private have been established in all Districts to meet the requirements for propagation of bamboo.

The Village Bamboo Development Committees (VBDC) has been formed at village level where bamboo plantation is taken up. These committees are composed of bamboo growers, women groups, youth and VC/VDB members.

The NBDA facilitates the VBDCs in strategizing, implementing and identifying areas for resources and enterprise development. Micro-finance facility is provided to VBDCs in the form of Revolving Fund. Training on bamboo plantation, management of existing stocks through scientific method and method of pest and diseases control to improve productivity have been imparted to all the VBDCs through districts level farmers training.

6. RESULTS AND DISCUSSION

Though 22 species of bamboo are available in Nagaland, only three species Kako, Dolo and Jatiare are being cultivated by majority of the villagers in Dimapur district, though nearly 60 species are cultivated in India (**Anon, 1988**). It was also found that labour charges were high in the village with an average of Rs. 5000 per acre. Cost of bamboo for plantation was Rs. 5 per sapling where cultivation cost per hectares was Rs. 10,000 approx. An average harvest of bamboo per hectare was 15 tons and maintenance cost at Rs. 3335 per acre.

Under the assistance for bamboo plantation projects, the agency is providing revolving fund assistance to the village Bamboo Development Committees. The concept of the revolving fund assistance and its application has been formulated in the line with the revolving fund scheme. The revolving fund placed at the disposal of the VBDCs are utilized to provide soft loan assistance to the bamboo farmers and villager for taking up income generating activity as a stop gap arrangement before the bamboo plantations can generate income. The VBDCs manage the fund under the supervision of the agency officials.

TABLE 4: PLANTATION AND HARVESTING FROM ONE HA.BAMBOO PLANTATION

Year	Total no. of clums appear	No. of clums ready for harvest and sale	Rate	Amount
1st year	400	Nil	Nil	Nil
2nd year	1200	Nil	Nil	Nil
3rd year	3600	2400	Rs.50	120,000
4th year	7200	4800	Rs.50	240,000

TABLE 5: CONSUMPTION PATTERN OF BAMBOO IN INDIA

Uses	Percentage consumption (%)
Pulp	35.0
Housing	20.0
Non-residential	5.0
Rural areas	20.0
Fuel	8.5
Packing including basket	5.0
Transport	1.5
Furniture	1.0
Other wood working industries	1.0
Other including fodders, mats etc.	3.0
Total	100.0

Source: Tewari, 1992

REASONS FOR PREFERRING CULTIVATION OF BAMBOO

When the researcher surveyed the bamboo growers, they were asked about reasons for preferring bamboo cultivation and asked them to rank it.

H_o: There is no significant difference in the perceived reasons high profit, suitability of soil and climate condition for preferring bamboo cultivation.

TABLE 6: REASON FOR BAMBOO CULTIVATION

	N	Mean	Std. dev.	Min	Max	Percentiles			Mean Rank
						25th	50th	75th	
1.High profit	104	1.0577	.27260	1.00	3.00	1.0000	1.0000	1.0000	1.07
2.Suitability of soil	104	2.6058	.95955	1.00	5.00	2.0000	2.0000	4.0000	2.62
3.Inter crop cultivation	104	6.0096	.22011	5.00	7.00	6.0000	6.0000	6.0000	6.01
4.Lum-sum amount	104	3.4519	1.06013	1.00	5.00	2.0000	4.0000	4.0000	3.46
5.Hereditary	104	4.3077	1.09790	1.00	7.00	3.0000	5.0000	5.0000	4.32
6.Stackable produce	104	6.9423	.27260	5.00	7.00	7.0000	7.0000	7.0000	6.94
7.Suitable Climatic	104	3.5769	.95218	2.00	5.00	3.0000	3.0000	5.0000	3.58

Source: Primary data

The table shows the median of high profit, suitability of soil, inter crop cultivation, lump-sum amount, hereditary, stackable produce and suitability of climatic condition as 1 (1 to 1), 2 (2 to 4), 6 (6 to 6), 4 (2 to 4), 5 (3 to 5), 7 (7 to 7), 3 (3 to 5), respectively. The mean value is lowest in high profit with its figure 1.0577 followed by suitability of soil and lump-sum amount as 2.6058 and 3.4519……

TABLE 6.1: TEST STATISTICS [a]

N	104
Chi-Square	529.286
df	6
Asymp. Sig.	.000

a. Friedman Test

The above table provides the test statistic (χ^2) value (chi-square) =529.286, degree of freedom (df) =6 and significance level (Asymp. Sig.)=.000, which is all we required for Friedman Test. From the above tables it is clearly seen that there is an overall statistically significant difference between the mean ranks of the related groups.

There is a statistically significant difference in perceived reasons for the cultivation of bamboo by the farmers, χ^2 (2) = 529.286, *P* = .000
Median perceived efforts levels for the high profit, suitability of soil; inter crop cultivation, lump-sum amount, heredity, stackable produce and suitable climatic condition were 1 (1 to 1), 2 (2 to 4), 6 (6 to 6), 4 (2 to 4), 5 (3 to 5), 7 (7 to 7), 3 (3 to 5), respectively.
Table mean table also shows that high profit, suitability of soil, lump-sum amount and climatic condition are the main preference given by the famers for cultivation of bamboo since they are given the first priority in rank. Also the sig. level is less than .05 and hence null hypothesis is rejected. Therefore, it leads to the conclusion that high profit, suitability of soil and climatic condition are the main reasons for the cultivation of bamboo.

PROBLEM FACED BY FARMERS IN BAMBOO CULTIVATION

Borers like Beetles and Termites are the most commonly occurredinsects that attack bamboo. Untreated bamboo has a high possibility of being attacked by the insects since the insects obtained their food from the bamboo. Therefore the bamboo should be treated well to avoid infestation.
Bamboo in suffers assiduously from insect damage, right from the seed to the finished products, many insect pests including borers, defoliators, culms and shoot borers and sap-suckers attack the plants and hamper the growth and production. In India 66 species of sap-suckers are found, of which two species are major pets where sap-sucking aphids were observed as major pests **(Revathi T. G, et al, 2001)**
The most commonly preventive measures taken by the farmers are to cut and burn. Therefore bamboo should be treated well but unfortunately it seems to be quite difficult when it comes to treatment of bamboo because the skin of the bamboo is very compact. It is very important for the bamboo to be got treated because the durability of the bamboo seems to be lower than compared to other wood. In most application it is not enough for an economic lifetime because the life of an untreated bamboo varies from one to fifteen years only depending on the variety of the species if they are left contact with the water, undercover, humidity etc.
H_0: There is no significant difference in the perception of growers with regard to problems in bamboo cultivation.

TABLE 7: PROBLEM FACED BY THE BAMBOO CULTIVATORS

	N	Mean	Std. dev.	Min	Max	Percentiles			Mean Rank
						25th	50th	75th	
1.Severity of disease and pests	104	3.3942	.86370	1.00	4.00	3.0000	4.0000	4.0000	3.39
2.High labour charges	104	3.2692	.52567	1.00	4.00	3.0000	3.0000	4.0000	3.27
3.Lack of scientific knowledge	104	1.0385	.23824	1.00	3.00	1.0000	1.0000	1.0000	1.04
4.Weeds	104	2.2981	.60547	1.00	4.00	2.0000	2.0000	2.0000	2.30

Source: Primary data

Table shows that the median value for severity of disease and pests, labor shortage and high labor charges, lack of scientific knowledge and weeds were 4 (3 to 4), 3 (3 to 4), 1 (1 to 1), 2 (2 to 2) respectively. Mean value, lack of scientific knowledge shows the fewer figures 1.0385 which indicate the major problem followed by weeds value as 2.2981, high labor charges as 3.2692 and severity of disease and pests as 3.3942.
From the above table we can justify that lack of scientific knowledge among the cultivators is the major problem faced by the cultivators followed by the weeds spreading of the bamboo. Labour shortage and high labour charges comes under the third important problem ranked by the farmers followed by the severity of disease and pests.

TABLE 7.1: TEST STATISTICS [a]

N	104
Chi-Square	222.658
df	3
Asymp. Sig.	.000

a. Friedman Test

The above table provides the test statistic χ^2value (chi-square), degree of freedom (df) and the significance level (Asymp. Sig.), which is all the Friedman Test, can report. We can see form the table, that there is an overall statistically significant difference between the mean ranks of the related problems. Since Friedman Test is an omnibus test like its parametric alternatives i.e. it can show only whether there are overall difference but does not pinpoint which problem in particular differ from each other.

THE OUTPUT OF THE FRIEDMAN TEST

There was a statistically significant difference in perceived effort depending on which specific constraints the farmer have a major problem, χ^2 (2) = 222.658, *P* = .000.
However, we know that there are differences somewhere between the related groups but we don't know where exactly those difference lie. To examine where the difference actually occur, we need to run Wilcoxon Signed-Rank Tests on the different combinations of related problems.

1. Severity of disease and pests to labor shortage and high labor charges.
2. Severity of disease and pests to lack of scientific knowledge.
3. Severity of disease and pests to weeds.
4. High labor charges to lack of scientific knowledge.
5. High labor charges to weeds.
6. Lack of scientific knowledge to weeds.

Here, we need to use Bonferroni adjustment on the results we get from Wilcoxon Signed-Rank Test since we are making multiple comparison, which makes it more likely that we will declare a result significant when we shouldn't (Type I error). The Bonferroni adjustment is calculated by taking the initial significant level (0.05) and dividing it by the number of tests we run. Now, we have a new significant level of 0.05/6 = 0.083. This means that if the *P* value is larger than 0.083 then we do not have a statistically significant result.

RUNNING THE WILCOXON SIGNED-RANK TEST, WE GET THE FOLLOWING RESULT

TABLE 7.2: TEST STATISTICS [c]

	High labour charges - Severity of disease and pests	Lack of scientific knowledge - Severity of disease and pests	Weeds - Severity of disease and pests	Lack of scientific knowledge - High labour charges	Weeds - High labour charges	Weeds - Lack of scientific knowledge
Z	-.797a	-9.066a	-6.689a	-9.138a	-8.116a	-9.282b
Asymp. Sig. (2-tailed)	.425	.000	.000	.000	.000	.000

Source: Primary data

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

We can see that at the *P*< 0.083 significance level the perceived problems between (lack of scientific knowledge - severity of disease and pests, weeds – severity of disease and pests, lack of scientific knowledge – high labor charge, weeds – high labor charges, weeds – lack of scientific knowledge *P* = 0.000) was statically different except (high labor charges – severity of disease and pests, *P* = 0.425).

THE RESULT OF FRIEDMAN TEST (WITH POST-HOC TESTS)

There was a statistically significant difference in perceived problems depending on the different constraints $\chi^2(2) = 222.658$, P = .000. Post-hoc analysis with Wilcoxon Signed-Rank Tests was conducted with a Bonferroni correction applied, resulting in a significance level set at *P*< 0.083. Median perceived level for severity of disease and pests, labor shortage and high labor charges, lack of scientific knowledge and weeds were 4 (3 to 4), 3 (3 to 4), 1 (1 to 1), 2 (2 to 2) respectively. There was no significant difference between the high labor charges and severity of disease and pests (Z = -797, *P* = .425). Since *P* value is greater than 0.083 in high labor charges and severity of disease and pests, we reject null hypothesis. Therefore, it is concluded that lack of scientific knowledge and weeds are the main problem faced by the cultivators.

7. CONCLUSION

Bamboo is one of the rich resources abundantly available in Nagaland but was not economically exploited though it has survived through centuries as an integral part of Naga society. While traditional usage has been extensive, the great ecological and economic potential came to light with the formation of Nagaland Bamboo Development Agency (NBDA) in 2004. Bamboo, known as a poor man's timber has now been transformed into green gold because of its potential to provide ecological and economic benefits to the people. But due to the lack of scientific knowledge among the farmers, there have been a problem in cultivation and therefore, it is suggested that scientific plantation of bamboo with specified spacing between saplings should be adopted and cultivated. Management of clump forming bamboo should be utilizing while cultivation and mulching of bamboo plant should also be considered in a nurseries or while cultivating.

Therefore, the Naga people have survived through the centuries with the diverse and varied uses of bamboo. From the cutting of the umbilical cord to the mats that have used for wrapping the bodies for burial, the bamboo has been integral to the life of the Nagas. It continues to play a predominant role in the life of the people even today in every walk of life that ranges from agricultural tools and implements to shelter, food and livelihood.

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