BAMBOO PROCESSING INDUSTRY IN MIZORAM: A CASE STUDY OF ZONUN MAT PLY INDUSTRY

A DISSERTATION SUBMITTED
FOR THE AWARD OF THE DEGREE OF
MASTER OF PHILOSOPHY (M.PHIL) IN ECONOMICS

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C E R T I F I C A T E

This is to certify that the dissertation titled "**Bamboo Processing Industry in Mizoram : A Case Study of Zonun Mat Ply Industry**" by Shri Lianhmingthanga has been written under my guidance.

The dissertation is the result of his investigation into the subject. This dissertation was never submitted to any other University for any research degree.

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D E C L A R A T I O N

I, Lianhmingthanga, do hereby declare that the dissertation titled - **BAMBOO PROCESSING INDUSTRY IN MIZORAM : A CASE STUDY OF ZONUN MAT PLY INDUSTRY** - is a record of work carried out by me and it has not been submitted for any research degree in any other University or Institution. This dissertation has been being submitted to the Department of Economics, Mizoram University for the award of the degree of Master of Philosophy in Economics.

(LIANHMINGTHANGA)

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C H A P T E R - 1

INTRODUCTION

Mizoram (Land of the Mizo people) is one of the Seven Sister States in North Eastern India, sharing borders with the states of Tripura, Assam, Manipur and with the neighbouring countries of Bangladesh and Burma. Mizoram became the 23rd state of India on 20th February, 1987. Anthropologists classify the natives as Tibeto-Burman speaking member of the Mongoloid race.

Agriculture is the mainstay of the economy of Mizoram. More than half of the total workers in the State are engaged in agriculture. This follows that the State is not a highly industrialized state. The traditional industries of weavers and blacksmiths played an important role but most of their products are for home consumption and very little are put up in the market for sale. Mizoram has plenty of raw materials for industry mostly from forest, agriculture and horticulture. Apart from the ginger, maize and fruit juice plants, there is potential for setting up different industrial projects based on locally produced fruits, tea, coffee, chillies, oilseeds, sugar cane, meat, milk, etc. The local crafts including Mizo hats, side bags, floor rugs, aprons, cane works and Mizo shawls have become very popular all over India. The tourism industry is also picking up well in Mizoram.

Bamboo is traditionally called ‘mau’ in Mizo language. With an approximate coverage of one third total forest land area, bamboo is a way of life for the people of the Mizoram. The traditional living and lifestyle of Mizo society, to a large extent, is dependent on bamboos for its variety and uses and it has much to offer by way of contributing to socio-economic advancement of the State. The strength of culms, straightness and lightness combined with hardness, range in size, hollowness, long fibre and easy working qualities make bamboo suitable for a variety of purposes. It is used extensively in house construction, as food and for handicrafts and day-to-day household

items. It has immense potential in improving rural economy, promoting industrial development and establishing a sound economic base for the State on sustained basis.

1.1 BAMBOO – CONCEPT AND SIGNIFICANCE

Originally known as a poor man's timber, bamboo today has gained great importance in the world economy and has undoubtedly become one of the most important renewable resources, which is capable of producing maximum biomass per unit area and time. It is a fast growing, renewable, widespread, low cost, environment enhancing resource with great potential to improve poverty alleviation and environment conservation. Bamboo can be utilised at all levels of industrial activity from small craft based industries to modern highly integrated plants. Bamboo industry is making important contribution in providing food, housing and income generation for 2.2 billion people in the world. Half of the world's population is involved in the use and trade of bamboo products. As the market for environment friendly green bamboo is growing, it is estimated that the world bamboo market will grow from its present size of USD10 billion to over 20 billion by 2015.[1]

Bamboos are a group of perennial evergreens in the true grass family Poaceae, subfamily Bambusoideae, tribe Bambuseae. They are tall, arborescent woody grasses, belonging to the family *Graminae*; only a few species being solid, most being hollow and often gregarious in nature. They consist of three distinct morphological parts, viz., the leafy aerial part (the culms) and two underground parts (the rhizome and the roots). Bamboos are the fastest growing plant

[1] Xuhe, C., (2003) *Promotion of Bamboo for Poverty Alleviation and Economic Development*. Journal of Bamboo and Rattan, vol.2, No. 4.pp.345-350.

that grows three times faster than the fastest growing tree. They are capable of growing 100 cm (39 in.) or more per day due to a unique rhizome-dependent system. However, the growth rate is dependent on local soil and climatic conditions. Most of the bamboos require a temperature ranging from 8° to 36°, a minimum of 100cm annual rainfall and high humidity for good growth. This growth pattern thus makes it easily accessible in the minimal amount of time. Moreover, it is a viable alternative to wood and is the strongest building material. Its tensile strength is 28,000 per sq. in. against 23,000 of steel. It is eco-friendly because it generates more oxygen and enriches the soil and is directly related to the economy of a region because it provides income, food and housing to 2.3 billion people worldwide.[2] It has been estimated that in the world market of bamboo, the combined value of internal and commercial consumption is to the value of US $ 10 billion (₹ 45,000 crores) every year. The total revenue based products is estimated at ₹ 25,000 crores.[3]

In India, bamboos are found naturally in many types of forests in almost all the states except Jammu & Kashmir where they are cultivated. They are distributed in Assam, West Bengal, Arunachal Pradesh, Manipur, Meghalaya, Tripura, Nagaland, Western Ghats, Andaman and Mizoram. In fact, more than 58 species of bamboos occur in the eastern states of India, of which 20 species has been reported to be found in Mizoram.[4]

A bamboo industry is essentially agricultural with majority of market and supply going to agricultural requirements such as for fish pens, banana props, and other low-value applications like scaffoldings

[2] Goswami, Priyam (2005) *Indigenous Industries of Assam, Retrospect and Prospect*, Anshah Publishing House, Delhi.
[3] Environment and Forest Department, Govt. of Mizoram (2010), *Bamboos of Mizoram: A Report*, Mizoram.
[4] Jha, L.K. (1997) Natural Resource Management, APH Publishing Corporation, New Delhi.

and fences. On the other hand, there is also a bamboo processing industry although its components vary in characteristics such as structure, competitiveness, and maturity. By all-important measures, the bamboo processing industry has been in existence for quite some time. However, this sector's influence in the country's economic development has been, at best marginal. As one have major influences in the country's socio-economic aspect, the sector remains to be a potential, emerging industry.

Even as early as 1956, institutional support to the bamboo processing industry is evident when Forest Products Research and Development Institute (FPRDI) scientists studied the use of bamboo as material for various applications including walls, panels, roof, trusses, and novelty products (furniture, handicraft and decors). Subsequently, FPRDI and Cottage Industries and Technology Center (CITC) studied the possible use of bamboo as substitute to wood for various applications such as ply, composites, pulp and paper, and other architectural applications.[5] When the government declared that the supply of wood is threatened and partially banned logging in forest areas, the interest in bamboo as a substitute to wood became even more pronounced.

1.2 BAMBOOS IN MIZORAM

Nearly 28% of the total bamboo area of the country is found in the North-Eastern states.[6] Of which Mizoram possesses the maximum percentage of its geographical area under bamboo forests as compared to other states of the country. The State has more than 91 percent of its

[5] FOSTER-ASIA (1998), *The Foundation for Sustainable Techno-Environmental Reforms*. October 1998. A Study on the Bamboo Processing Industry.
[6] Rai, S.N. and K.V.S. Chauhan (1998) *Distribution and Growing Stock of Bamboo in India*. Indian Forester, 124:89-98

geographical area under forest cover. Out of this, bamboos occupy 7,000 sq. km. area, which is around 33% of the total land area of the State.

Large tracts of bamboos are seen throughout Mizoram but their distribution is restricted to about 1,600 metres and below. They occur mostly between 40 metres and 1,520 metres in tropical and sub-tropical areas. Few species occur in temperate areas in Blue Mountain and Mount Chalfilh. It appears that bamboos have resulted from jhumming system of cultivation.[7]

Fig 1.1 ***Bambusa tulda*** (pic : Maengi)

Out of the total bamboo area of the state (7,091.66 sq. km.), Lunglei has the maximum area of 1,956.59 sq. km., followed by Mamit (1,598 sq. km.), Aizawl (927.69 sq. km.), Lawngtlai (730.79 sq. km.), Kolasib (661.80 sq. km.) and Serchhip (439.08 sq. km.).

There are about 20 species of bamboo which occur naturally in the State[8]. However, there was confusion about their proper identification and the exact number of species available in the State. But a recent survey was carried out extensively in all possible nooks and corners of the State to collect and identify different species of bamboo. It was reported that there are 35 species under 9 genera present in the State. They are enumerated below with their Mizo name and their uses.

[7] Deb, DB and R.M. Dutta (1987) *A Contribution to the Flora of Mizoram.* J.Econ. Tax. Bot., 10(1):21-61

[8] Government of Mizoram (June 2010) '*Bamboos of Mizoram*' Environment and Forest Department

Table 1.1 Bamboos in Mizoram

Group/Species	Local Name	Uses
Bambusa balcooa	-	Building purposes, agricultural implements and scaffoldings
Bambusa bambos	Rawhling	Floating heavy timber, structural purposes, mat-making, basket works
Bambusa dampaeana	-	-
Bambusa mizorameana	Talan	Pandal making, agricultural implements, baskets, heads of men's pipes
Bambusa multiplex	-	Hedge, ornamental in garden, umbrella handles, fishing rods
Bambusa nagalandeana	Ralleng mau	-
Bambusa nutans	Ankuang	Sundry ornamental, rafters, shafts of ekkas
Bambusa tulda	Rawthing	Mats, furniture, scaffolding, hats, wall plates, wall hangers, toys, writing & printing paper, RCC construction, edible
Bambusa vulgaris	Vairua	Toys, handicrafts, fencing, ornaments
Bambusa vulgaris var. *vittata*	Yellow bamboo	Ornamental planting, poles, construction, pulping
Bambusa vulgaris f. waminii	-	Ornamental purpose
Dendrocalamus asper	-	Building, water containers, edible
Dendrocalamus giganteus	-	Building construction, paper pulp, crafting, edible
Dendrocalamus hamiltonii	Phulrua	Construction, baskets, mats, water and milk vessels, fuel, floats, edible
Dendrocalamus hookeri	Rawpui, Rawlak/Rawkhauh	-
Dendrocalamus latiflorus	-	Construction, edible.

Dendrocalamus longispathus	Rawnal	Thatching construction, basket making, fuel, posts, mat making, furniture, edible
Dendrocalamus manipureanus	Rawchhe, Rawchhe-changdam	-
Dendrocalamus sikkimensis	Rawmi	Containers, churns, edible
Dendrocalamus strictus	Tursing	Paper, construction purposes, furniture
Melocalamus compactiflorus	Sairil	Hat and basket making
Melocanna baccifera	Mautak, Maomitvel	Paper, pulp construction purposes, fencing, edible
Neomicrocalamus mannii	Siaman	Building
Phyllostachys edulis	-	-
Phyllostachys mannii	-	Fencing, construction, walking sticks
Schizostachyum dullooa	Rawthlaw	Ceiling, partition wall, baskets, umbrellas, Mizo looms, kites
Schizostachyum fuchsianum	Rawnal	Basket making, edible
Schizostachyum mannii	Rawte, Chatle	-
Schizostachyum munroi	Nat	Bows and arrows, traps, edible
Schizostachyum pergracile	Mau-dang	Shingles, mats, baskets, paper, pulp, tying
Schizostachyum polymorphum	Chal	Basket making, fishing net frames, pipe, edible
Sinarundinaria falcata	Lik	Arrows, hedges, baskets, fishing rods, pipes, hookas
Sinarundinaria griffithiana	Phar	Construction, fencing
Sinarundinaria longispiculata	-	-
Thyrsostachys oliveri	Phunkirua	Building purposes, broom handles, agricultural implements, lance staves, fishing rods

Source: Compiled from *Bamboos of Mizoram*, Environment and Forest Dept., GOM.

It cannot be denied even from the table above that from its area coverage and the varied species present in the state, Mizoram is an environmentally suitable region for the cultivation of bamboo. As such, bamboo occupies an important place among the forest resources of Mizoram. Moreover, Mizoram has been deemed to be the first state in the country to utilise its bamboo resources to meet its growing industrial needs.[9]

Bamboo plays a very important role in the socio-economic life of the people as large number of people, especially in the rural areas, depends on it for their livelihood. Bamboo is a way of life for the people of Mizoram. It is used in a variety of ways right from construction of houses, temporary shades and huts along the road sides for selling agriculture produce and in jhum areas for the management and protection of their crops, for making various household items such as benches, stools, kitchen utensils, different kinds of fencing, agricultural implements, fishing devices and traps for wild animals, etc. Besides these, the people extensively use bamboo for performing various rituals and religious ceremonies.

Thus, bamboo has been used in Mizoram in a variety of ways ranging from daily usage like toothpicks, incense sticks, etc. to that of construction material like bamboo ply and scaffolds. Moreover, bamboo has been the main material for pulp in paper industries. It is still the main material and will continue so due to its short growth cycle, large biomass production and rapid vegetative multiplication. It must be noted that about half of India's bamboo consumption is for making paper pulp. The Govt. of Mizoram has also exported bamboo to other parts of the country for paper mills as well.

[9] http://kaladan.com/111/mizoram-bamboo-industry-experiencing-remarkable-growth/

Bamboos are annually worked under Mahal system since the District Council Period. Mahal system is operated for Riverine Reserve and Inner line Reserve Forests only, covering 20 to 23 rivers & tributaries. Most of the Bamboo harvested by the Mahaldars is supplied to Hindustan Paper Corporation (HPC) at Panchgram in Karimganj District of Assam. Rivers are preferably used for bamboo transportation to HPC through Barak river. Recently, there arose some friction between a paper mill in Cachar (Assam) and the Government of Mizoram. The Mizoram Govt. has recently suspended the export of bamboos that are harvested under the mahaldari system from the time Mizoram was a district council under Assam (prior to 1972). This led to a loss of an average ₹ 1.8 crore lakh daily for the part of the paper mill. This was done so by the Mizoram Govt. in order to stop the huge loss and properly tap the resources in a more profitable way like setting up of bamboo chip industries. The current state administration wishes to increase revenue streams from bamboo and aside from uses as a substitute for timber, there is research underway to utilise bamboo more widely, such as using bamboo chippings for paper mills, bamboo charcoal for fuel, fertiliser and the manufacture of pressed wall panels.

During 1976-77, the Government has initiated for another paper mill in Mizoram. The feasibility study suggested for a plant at Bairabi with capacity of 200 metric tonne (MT) per day of printing and writing paper. But it could not materialise. There might have been some flaws in the project, which can be removed by redesigning the same and it may be taken up again to turn the vast untapped bamboo resource known as ‘green gold’ of the state into ‘cash gold.’

At present, only a small percentage of bamboo resource is harvested for the purpose of local construction, tiny handloom and handicraft production. While the total bamboo yield works out to be

3,237,689 MT/year in Mizoram, the annual aggregate consumption figures at 28, 315 MT/year, resulting an annual bamboo surplus of 3,209,374 MT, i.e., use of bamboo resources extracted accounts for 1% of the total yield and thus 99% of the surplus bamboo yield of Mizoram remain either underutilised or we may even say unutilised. Notice must also be given to the substantive quantity of bamboo available outside the Government Forest in revenue land where it is used as burning material during jhum operation and is not harvested. Thus, there is a huge surplus of bamboo resource which can be scientifically and gainfully utilised for generating huge amount of resources to the State.

1.3 FLOWERING OF BAMBOO

There are two types of flowering in bamboos, viz., gregarious flowering and sporadic flowering. When gregarious flowering occurs, the clumps of an entire species flower, produce seed, and then die. Although large quantities of seed are produced during gregarious flowering, they are viable only for a short period, sometimes only for a few days or months. Sporadic flowering occurs in many species, including *Yushania alpina*, *Dendrocalamus giganteus*, *Dendrocalamus strictus*, *Dendrocalamus hamiltonii*, *Bambusa tulda*, and *Guadua angustifolia*, among many others. In this type of flowering, seeds are produced but the clumps generally survive. What triggers the flowering of bamboo is not yet scientifically understood and the onset of flowering is therefore not predictable. For many tropical bamboos, flowering intervals range from 40 to 80 years.

Like other parts of the world, both sporadic and gregarious flowering of bamboo is suffered in Mizoram as well. As a result of such, Mizoram has suffered from famine known locally as 'mautam' or

'thingtam' every few decades. The synchronous flowering of bamboo species, which naturally flower and then die at regular intervals, causes the problem. When bamboos flower, it produces many seeds and fruit that cause rodent feeding frenzies. The mautam always leads to dramatic increase in local rat population as well as producing swarms of insects, which then spread to the human food storage areas after the natural harvest is expired - destroying stocks and food crops. Historically it led to death by starvation (102 in 1859) and even today brings hardship to many rural communities whose very survival depends on a successful harvest.

The famines are called after the name of the bamboo that flower. *Meloccana baccifera* is called ‘Mautak’ in Mizo and the famine that is caused by its flowering is named ‘Mautam’. When *Bambusa Tulda* flowers (‘Rawthing’ in Mizo), the consequent famine is known as ‘Thingtam’. The first Thingtam famine in 1739 was followed by a Mautam in 1769. A Mautam famine occurs 30 years after a Thingtam famine and the latter occurs 18 years after a Mautam. This gives a cycle of around 48 years. There was a Mautam famine in 2006- 2007 and so a Thingtam is expected in 2025. The next more severe Mautam famine is expected in 2055.

1.4 PROCESSING INDUSTRIES AND SMALL SCALE INDUSTRIES

Small scale industries are those industries whose capital is supplied by the proprietor or through means of partnership or from financing agencies set up for this purpose. In India, the first official criterion for small scale industry dates back to the Second Five Year Plan when it was defined in terms of gross investment in land, building, plant and machinery and the strength of the labour force. In 1955, Small Scale Industries Board defined small scale industry as

"A unit employing less than 50 persons, if using power and less than 100 persons without the use of power and with capital assets not exceeding five lakhs."[10] However, with a view to enhance the development of the sector, the investment limit has changed over the years.

Table 1.2: Changes in the Definition of
Small Scale Industries in Terms of Investment Limits

Sl.No.	Year	Investment Limits	Additional Conditions
1	1955	Up to ₹ 5 lakhs in fixed assets	Less than 50/100 persons with/without power
2	1960	Up to ₹ 5 lakhs in plant and machinery	No conditions
3	1966	Up to ₹ 7.5 lakhs in plant and machinery	No conditions
4	1975	Up to ₹ 10 lakhs in plant and machinery	No conditions
5	1980	Up to ₹ 20 lakhs in plant and machinery	No conditions
6	1985	Up to ₹ 35 lakhs in plant and machinery	No conditions
7	1991	Up to ₹ 60 lakhs in plant and machinery	No conditions
8	1997	Up to ₹ 3 crores in plant and machinery	No conditions
9	2000	Up to ₹ 1 crore in plant and machinery	No conditions
10	2006	Up to ₹ 5 crores in plant and machinery	No conditions

Source: Compiled from various Acts and Notifications

At present, small scale industry (Micro, Small and Medium Manufacturing Enterprises) is defined as an industrial undertaking which is engaged in manufacturing, preservation, processing, mining and quarrying or assembling, and in which the investment in fixed assets in plant and machinery does not exceed Rs. 5 crores subject to

[10] Small Scale Industries Board, quoted by Desai, Vasant (1983) *Organisation and Management of Small Scale Industries*, Himalaya Publishing House, New Delhi.

the condition that the unit is not owned, controlled or subsidiary of any other industrial undertaking. [11]

These industries generally use power driven machines and also employ modern methods of production, engage labour on wage, products for expanded market. Their work pattern is generally on permanent basis. Such industries can be managed with little resources and in terms of returns, they provide greater results. Unlike a large industry which calls for a great deal of technical skill and manpower, a small scale industry is relatively skill-light and provides the entrepreneur every opportunity to broaden his technical and managerial capability.[12] It is a well known fact that the industries present in Mizoram are by and large of the small-scale type.

Processing industry has been defined as an industry in which raw materials are treated or prepared in a series of stages, e.g., using chemical processes. Process industries include a variety of industries such as oil refining, petrochemicals, water and sewage treatment, food processing and that of pharmaceuticals. In line with this definition, the term 'bamboo processing industry' may be defined as "industries in which bamboo is the raw material that is treated and processed to manufacture more modern and commercial goods."

Processing can also be differentiated from 'production.' The difference lies in the raw material. In production, the raw material is not procured from outside, but is owned by the company and after processing, manufactures the final product. But in processing, the company procures the raw material from outside, and then makes the final product. Processing is a process of converting raw material in to finished product by using various processes, machines and energy. It

[11] Micro, Small and Medium Enterprise Development (MSMED) Act, 2006.
[12] Laskar, Baharul Islam (2010) *Industrialisation in Mizoram Problems and Prospects*, New Central Book Agency (P) Ltd. Kolkata.

is a narrow term. Production is a process of converting inputs into value added output and is a broader term. Every type of processing is production but every production is not a processing.

1.5 BAMBOO PROCESSING INDUSTRY IN MIZORAM

The highest value addition of bamboo is manufacturing of construction materials such as bamboo mat, board, mat ply, bamboo scantling, etc. In addition to generating direct and indirect employment, these units have a good number of market demands in and outside the state. Few numbers of industries have been set up to tap the State's natural resource and many more are expected to come up in the near future.[13] The industries already established and/or are under construction are:

1. M/S Zonun Mat Ply, Lengpui
2. M/S CeeKee Bamboo and Wood Products, Thingdawl
3. M/S Grace RTP, Bualpui
4. M/S Nutech Bamboo, Kolasib.

In 1992, a bamboo processing industry, Zonun Mat Ply industry, was set up in Mizoram by a private entrepreneur to exploit bamboo and process it to ply and mat boards that are fit for construction purposes. It has been stated that the commodities produced by the industry are eco-friendly and has a vast market potential. It has its head office at Zarkawt while the industry is sited at Lengpui village. Zonun Mat Ply industry started its commercial production of bamboo ply and boards in 2004 and currently employs 43 workers (as on October, 2011).

[13] Planning & Programme Implementation Department, Government of Mizoram (2011), *Economic Survey:Mizoram*, Aizawl.

In addition to sale of its products in the local market, Zonun Mat Ply industry has been able to export its products to other states of the country like Goa, Delhi, Bangalore, Kolkata, Guwahati among others. The industry experienced its boom when it supplied its ply to the 2004 tsunami-hit victims through the Tsunami Rehabilitation Programme (TRP) in the Andaman and Nicobar group of islands in 2006. The eco-friendly bamboo based products produced now finds wide applications in items such as low-cost furniture and housing with high potential for rural development. Thus, bamboo is an attractive resource compared to forest hardwoods because it could be processed into composites, which are a viable wood substitute.

It can thus be seen that bamboo has gained great importance not only in India, but also in other economies of the world. In addition to its traditional uses such as agriculture implements, baskets, boats, caps, fences, mats and ornaments among others, bamboo is processed into ply and other industrial products which are extensively used for building, furniture, etc. Mizoram thus invites prospective private investors and Foreign Direct Investment (FDI) for setting up of industrial units for making bamboo chips, bamboo mat ply, toothpicks, bamboo blinds, chopsticks and incense sticks (agarbatti). Moreover, the Government of Mizoram through the Forest Department, Industry Department and its Bamboo Development Agency is encouraging its domestication. Successful domestication and efficient utilisation of this dominant forest resource of Mizoram can bring about favourable changes in the economy of Mizoram.

1.6 OBJECTIVES OF THE STUDY

The general objective of this research is to study and assess the potential of the existing bamboo processing industry and its contribution to development.

The specific objectives are:

i) to determine the contribution of bamboo processing industry to household livelihood income and thereby the development of the state economy.

ii) to examine the ecological feasibility of bamboo processing industry.

iii) to show how it is helpful in generating more employment opportunities for the people of Mizoram.

1.7 HYPOTHESES

H_0: Bamboo processing industry has a good potential for promoting economic development in Mizoram.

H_1: The economic impact of bamboo processing industry is not favourable for Mizoram economy.

1.8 METHODOLOGY

The particular bamboo processing industry viz. Zonun Mat Ply industry was chosen for the study because it is one of the most thriving ones of the bunch. It has been able to effectively export its products to other states of the country in addition to its sale in the local market. Moreover, the fact that it is run by a private entrepreneur also added to its interest.

Data was collected from primary sources by visiting the bamboo processing industry and the head office. Interview and questionnaire method was applied. In addition to visiting and

questioning the head office, questionnaires were distributed to all the 27 families residing in the quarters built in the property. Moreover, currently employed workers (who were 43 in total during the survey) were also questioned on their working conditions and their opinions on different matters concerning the Industry. 50 customers who purchased and extensively use the products were selected at random from different parts of the Aizawl City and given questionnaires which highlighted their opinion on numerous issues. Furthermore, prominent individuals who are thorough on the topic were also interviewed.

Secondary data was collected from different sources like previous related research works, statistical data, world bamboo resource reports and regional forestry and bamboo resource studies.

After primary and secondary data were collected, they were analysed and tabulated both mathematically and systematically in accordance with the objective of the paper. The percentile method is commonly used in this study.

1.9 CHAPTERIZATION

The study is divided into six chapters as follows:

Chapter 1 : Introduction

Chapter 2 : Economic Profile of Mizoram

Chapter 3 : Review of Literature

Chapter 4 : Potential of Bamboo Processing Industry in Mizoram: Opportunities and Threats

Chapter 5 : Zonun Mat Ply (P) Ltd.: An Empirical Analysis

Chapter 6 : Findings, Recommendations and Conclusion

Appendices

Bibliography

C H A P T E R – 2

ECONOMIC PROFILE OF MIZORAM

2.1 THE LAND AND THE PEOPLE

Mizoram, one of the seven sisters States of North-Eastern India, is located at the extreme south-eastern part of the country. The erstwhile Lushai Hill district became a Union Territory on 21st January, 1972. Consequent upon the passing of the 53rd Amendment Bill and the State of Mizoram Bill 1986 by the Parliament on 7th August 1986, Mizoram became the 23rd state of India on 20th February, 1987.[14]

Mizoram shares land border with the states of Tripura on the west, Assam and Manipur on the north, and has very long international borders with Bangladesh (on the west) and Myanmar (on the east and south). Lying between 21°56' and 24°35' N Latitudes and 92°16' and 93°26' E Longitudes, the state has a geographical area of 21,087 sq. km. consisting of eight districts - Aizawl, Lunglei, Saiha, Lawngtlai, Mamit, Kolasib, Serchhip and Champhai.

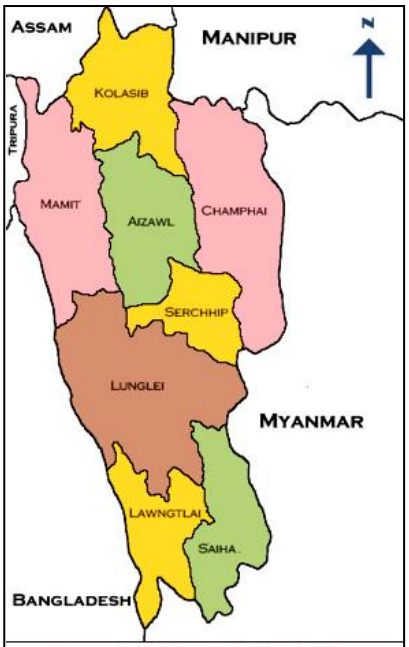

Figure 2.1 Mizoram District Map
(pic: http://en.wikipedia.org)

The region enjoys mild climatic conditions throughout the year. Seasons can be divided broadly into four: summer (March-May), rainy monsoon (June-August), autumn (September-October), and winter (November-February). The average temperature varies from about 11-26°C in winter to about 15-28°C in summer. During the rainy and autumn months the temperature is usually between 19°C and 25°C.

[14] C.Lalkima (1997), *Social Welfare Administration in a Tribal State: A Case Study of Mizoram*, Spectrum Publications, Guwahati.

Heavy monsoon rains are more or less evenly distributed throughout the region with an average rainfall of 254 cm per annum.

Aizawl is the capital city and heart of the state, and district centre of the Aizawl district. It occupies the coordinate of 23.73° North and 92.72° East, and situated at an altitude of 3,340 feet above sea level. The Tropic of Cancer runs just south to it. The region is generally cool during the summer with temperatures ranging from 20-30°C and winter temperatures range from 10-20°C. During the last five years the average annual rainfall reached its zenith in 2003 with 281 cm and its nadir in 2005 with 211 cm. The city perches precariously on the steep slopes of a sharp ridge, giving rise to numerous streams in between. Two rivers sandwich the whole area, Tlawng towards the west and Tuirial on the east. Chite, a large stream, also runs on the east.

It has the most varied terrain in eastern India. The hills are steep (average height 1,000m), separated by rives which flow either to the north or south, creating deep gorges between the hill ranges. Its tropical location combined with high altitude gives it a mild climate all the year round. It is rich in many kinds of tropical trees. The State has more than 91 percent of its geographical area under forest cover. Almost all kinds of tropical trees and natural vegetation thrive in Mizoram, but the outstanding group is the bamboos. 30% of the land is covered with wild bamboo forests. In fact, Mizoram harvests 40% of India's 80 million ton annual bamboo production, and remains the unsurpassed revenue of the state.

Ethnically, the Mizos are Tibeto-Burman and Kuki-Chin Tribes that formed the homogenous Mizo society. The closely ethnic tribes living in and outside Mizoram could speak one common language also called Mizo. Their complexion is less fair than that of the Chinese yet

they are descendant of Mongoloid stock. The word ‘Mizo’ is a generic term and is used to mean hill people or highlanders. ‘Ram’ means land and therefore, Mizoram would mean the land of the hill people or the land of the highlanders.

The Mizos live in a close-knit homogenous society and with no class distinction. There is no discrimination on the ground of caste or sex. It is a society in which the poor and the rich live together. They have a deep sense of duty towards others, especially to their kith and kin. To date, the Mizo society is a society wherein a minister and his peon or an officer and his driver dine together on the same table. This is because of the aforementioned absence of caste system. If ever a class distinction emerges in the society, it would be purely economic in nature.

2.2 POPULATION

Accounting for only 0.09 percent of India’s total population (1,21,01,93,422), Mizoram ranked the 29th most populous among the State and Union Territories as per the 2011 population census. It’s population stood at 10,91,014, consisting of 5,52, 339 males and 538, 675 females. The state’s population is projected at 11,56,393 in 2021. The decadal growth rate during 2001-2011 is 22.78 percent while it was 28.82 percent during 1991-2001.

Table 2.1: Population (as per 2011 census)

I	**Population**			
		Persons	**10,01,014**	
		Males	5,52,339	
		Females	5,38,675	
II	**Decadal Population Growth 2001-2011**		Absolute	Percentage
		Persons	**2,02,441**	**22.78**
		Males	93,230	20.31
		Females	1,09,211	25.43

III	**Density of Population (2011) (per sq.km.)**		**52**	
IV	**Sex Ratio (females per 1000 males) (2011)**		**975**	
V	**Population in Age Group 0-6 (2011)**		Absolute	Percentage
		Persons	**1,65,536**	**15.17**
		Males	83,965	15.20
		Females	81,571	15.14
VI	**Literates (2011)**		Absolute	Percentage to total population
		Persons	**8,47,592**	**91.58**
		Males	4,36,949	93.72
		Females	4,08,643	89.40

Source: Census 2011

The density of population of Mizoram is 52 persons per sq. km. while it is 382 persons per sq. km. in India (2011 census). Among all 8 districts, Aizawl district occupied highest density of population with 113 persons per sq km. The lowest density of 28 per sq km is observed in Mamit district. Moreover, the sex ratio shows a significant improvement as it is recorded at 975 females per 1000 males as against 935 females per 1000 males in the 2001 census. In terms of literacy rates, Mizoram is ranked the 3rd among the Indian states and Union Territories with a 91.58 percent rate of literacy following Kerala (93.91 percent) and Lakshadweep (92.28 percent).

According to the Mizoram Statistical Handbook released in 2010, out of the entire population of the State, the majority 7,72,801 (86.97%) are Christians followed by Buddhists with 70494 (7.93%) and Hindus with 31,662 (3.55%). About 8,39,310 (94.46%) belongs to Scheduled Tribe. A total number of 1,76,134 households were recorded in the 2001 census and out of these, Aizawl District has the highest share at 36.76%. With a share of 5.74%, Serchhip has the least number of household.

2.3 STATE ECONOMY

India's north-east is a kaleidoscope of ethnic and linguistic diversities harmonising themselves into a large national identity. This region despite its inherent advantages like fertile land, abundant natural resources in terms of rich flora and fauna, oil and some valuable minerals, a fairly homogenous and literate population, has been unable to keep pace with the economic and industrial development as recorded elsewhere in the country.[15] This may be due to geographical disadvantages or absence of essential infrastructure facilities, inadequate number of skilled local manpower and insufficient enterprise to take up the challenges of the manufacturing sector.

The economies of the constituent states of the region are underdeveloped and agrarian with a very weak industrial base and an inflated service sector mainly in the government. Income wise, north-east states have not done well either. Their per capita NSDP is lower than the all-India average except for Arunachal Pradesh and Mizoram.[16]

Regardless of it all, the Gross State Domestic Product (GSDP) of Mizoram is continuously increasing over the year. According to the latest available data found, GSDP at constant factor cost (2004-2005) prices is expected to attain an amount of ₹ 4,64,217/- lakhs in 2010-2011 against quick estimates of ₹ 4,26,839/- lakhs for the year 2009-2010 showing a growth of about 9% over the previous year. GSDP at factor cost at current prices is projected to touch ₹ 6,29,710/- lakhs in

[15] A.K. Agarwal (2005), "Structural Change in the Regional Economy: Trends and Implications," in *Polity and Economy: Agenda for Contemporary North-East India*, Edited by C. Joshua Thomas, Regency Publications, New Delhi, 105-106

[16] *Ibid.*

2010-2011, a change of about 14% over the previous year's figure of ₹ 5,49,793/- lakhs.[17]

The per capita income of Mizoram for the year 2009-2010 is estimated at 44,758/- as against the previous year's estimate of ₹ 38,145/- Per capita income at the national level is ₹ 46,492/- for the year 2009-2010.

2.4 OCCUPATIONAL STRUCTURE

Population Census 2001 reveals that out of the total population of 8,88,573 in the state, 4,67,159 (52.57%) were workers and the rest 4,21,414 were non-workers. The proportion of workers has gone up from 48.9% in 1991 census to 52.6% in 2001 census. It also reveals that proportion of workers was higher in rural areas at 55% than in urban areas which had about 45% of all workers. Also, female working population was about 56%. As per Census 2001, 60.6 percent of the total workers are engaged in agricultural activities.

Job seekers have been increasing over the years and there is persistent problem of unemployment especially among the educated youths. The number of job-seekers registered up to 31.12.2010 stood at 44,957 and the number of vacancies notified figured at 2006 during 2010-2011 while the number of applicants registered for self-employment assistance during 2010-2011 was 154.

As per Census of Government Employees, 2005, the number of employees working under the state government was 55,665 (as on 1st April, 2005) out of which 48,453 were regular employees and 5421 were muster roll and 1791 were work-charged. A total of 1,06,706 persons were employed in all the 47,730 enterprises in the state. Out

[17] Planning & Programme Implementation Department (2011), *Economic Survey: Mizoram*, Government of Mizoram, Aizawl.

of these 13,481 were employed in agricultural enterprise and 93,225 are in non-agricultural enterprises.

Out of the total workers in the state, 33,314 were employed in rural areas and 73,392 were employed in urban areas. In all, there are 64,276 hired workers.[18]

2.5 AGRICULTURE AND ALLIED

Agriculture occupies a very important place in the economy of Mizoram. The Economic Classification of workers 2001 census reveals that about 60 percent of the total workers are engaged in agricultural and allied activities. However, meeting only 20% of its requirement, the State is but deficient in food grain production.

Mizoram has a total geographical area of 21,08,700 hectares of which forests cover about 75%. The gross cropped area of the state is 1,33,226 hectares which is only 6.31% of the total area. It had been estimated in the 2001 census that there are 74,644 hectare of land having a slope of 0-25%. Out of this, only 11,198 hectares is currently under cultivation. Thus, the remaining 84% needs to be exploited for increased production and productivity.

A reduction of the area under jhum cultivation (from 44,974 hectare at the beginning of the 11th Plan to 28,735 during 2010-2011) is mainly due to the implementation of Watershed Development Programme for Shifting Cultivation Areas (WDPSCA), Oil Palm Development Programme and Sugarcane Cultivation Programme. Moreover, the productivity of rice under wet rice cultivation (WRC) has risen to 1.7MT/hectare from the level of 1.5MT/hectare at the beginning of the 11th Plan.

[18] Planning & Programme Implementation Department (2011), *Economic Survey: Mizoram*, Government of Mizoram, Aizawl.

New Land Use Policy (NLUP), the Flagship Programme of the State Government was given the highest priority during 2010-2011. The programme aims at gradually changing the practice of jhumming with a new pattern of land use through empowerment of people, preservation of environment, adoption of effective water harvesting measures and commercial utilisation of abundant local resources. ₹ 234.82 crores was specifically earmarked for NLUP which is being implemented through eight implementing departments. The number of targeted beneficiaries under the Government's Flagship Programme NLUP is 12,340.

2.5.1 Forest:

Based on 'State Forest Report – 2009' published by Forest Survey of India, Ministry of Environment & Forests, the forest cover in Mizoram accounts for 91.27% (19,240 sq. km.) of the State's geographical area. In terms of forest canopy density classes, the State has 134 sq. km. very dense forest, 6251 sq. km. moderately dense forest and 12,855 sq. km. open forest. Reserve forests constitute 47.31%, protected forests 21.34% and un-classed forests 31.35% of the total forest area.

Table 2.2: Area under various reserved forest in Mizoram

Sl.No.	Type of Forest	Area (in sq. km)
	A. State Owned	
1	Riverine reserved forest	1832.50
2	Innerline reserved forest	570.00
3	Roadside reserved forest	97.20
4	Other reserved forest	1886.09
5	Wildlife protected areas	990.75
6	B. District Council Forests	2562.00
	Total reserved forests	**7938.54**

Source: Mizoram Forest Statistical Handbook, 2008.

Mizoram has abundant natural bamboo resources which covers around 31% (about 6446 sq. km.) of its geographical area. As such, bamboos can and are being harvested and utilised for commercial purposes and contributes revenue to the exchequer. This is not the case in other trees of the forests mainly because of their poor stock.

A Centrally Sponsored Scheme, National Bamboo Mission, envisages increase in the area under bamboo plantation of selected species with intensive management so that the yield improves from the present 3 tonnes per hectare to about 18 to 20 tonnes. The Mission's activities are broadly classified into two – Forest and Non-Forest Areas. The schemes in forest areas are dealt directly by Environment & Forest Department through Forest Development Agency, whereas non-forest areas are dealt by the Bamboo Development Agency.

2.5.2 Border Trade:

On the Indo-Myanmar side, work is being undertaken for construction of residential quarters and construction of ware house adding to the already-accomplished work of constructing Composite Land Custom Station (LCS) building at Zokhawthar. Moreover, the Government of India has approved a project for improvement of Rih-Kalemyo road via Tiddim and Falam.

Moreover, on the Indo-Bangladesh border, since it is notified as a land of customs station, a Trade Facilitation Centre is being constructed at Tlabung. Construction of approach road to Kawpuichhuah Border Trade Centre is also under war. Because of technical advantage and scope of future expansion, a ICP Trade Centre was proposed to be established at Kawrpuichhuah, some 7 km. down-stream from Tlabung.

2.6 INDUSTRY

Owing its topographical and geographical condition coupled with underdeveloped infrastructure, Mizoram continues to remain an industrially backward State. The pattern of industrial development is not in conformity with the standard development historical trend. As such, it can be stated that industrialisation is yet to take off in the state.

2.6.1 Small Scale Industries:

As is already known, there is very little scope for either medium or large scale industrial units and as such, small industries dominate the industrial scenario acquiring a prominent place in the socio-economic development of the state. The total number of small scale units registered up to 2009-10 was 7,888.

Table 2.3: Growth of Small Scale Industries in Mizoram

Year	Cumulative number of registered units	No. of unit regd. during the year	Investment during the year (₹ in lakhs)	Employ-ment
2004-05	6080	319	717.50	1116
2005-06	6395	315	661.50	1228
2006-07	6739	344	791.20	1376
2007-08	6944	205	593.00	594
2008-09	7431	487	866.30	4113
2009-10	7888	457	1978.29	3977

Source: Economic Survey: Mizoram 2010-2011

The total number of small scale units registered up to 2009-10 was 7,888. 457 number of small scale industrial units were registered with an investment of ₹1978.29 lakhs and generation 3977 employment. The state government is presently running two common facility centres and one RIDC so as to promote industries in rural areas.

2.6.2 Bamboo-based industries:

Mizoram alone contribute 14 percent of the country's growing stock of bamboo covering 49.10 percent of the state's geographical area. The vast bamboo resources are becoming income earner for the State. Important initiatives have been undertaken.

Mention may be made of the establishment of bamboo chipping cluster which will allow the sale of raw bamboo as raw materials for paper mill with no value addition to be replaced by supply of bamboo chip with value addition and income generation in the chipping process. Nine chipping units had been set up and will be operational soon. These units are expected to generate good numbers of direct and indirect employment. Moreover, agarbati stick making units have also been taken up in a decentralised mode and integrated at the market level. Many families started engaging themselves in the production of square agarbati stick. This sector will give employment to weaker section of the society and this activity is included as one of the activities in the NLUP.

The highest value addition of bamboo is manufacturing of construction materials such as bamboo mat, board, mat ply, bamboo scantling, etc. These units had a good number of market demand in and outside the state. These units are generating a good number of direct and indirect employments. In addition, the government of Mizoram had taken initiative to revive the joint venture unit of Mizoram Venus Bamboo Products Pvt. Ltd., Sairang. This unit is designed to produce different kinds of construction and intermediate materials using bamboo as its raw materials.

The Bamboo Development Agency (BDA) since its inception in the year 2002 has been engaged in various activities for the development of bamboo sector in the state. BDA is the state agency to

carry out the vision for development of bamboo processing industry in the state and to create necessary infrastructure for bamboo processing industries.

2.7 INFRASTRUCTURE

Infrastructure is basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. It can be generally defined as the set of interconnected structural elements that provide framework supporting an entire structure of development.[19] The term typically refers to the technical structures that support a society, such as roads, water supply, sewers, electrical grids, telecommunications, and so forth, and can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions."

2.7.1 Power & Electricity:

Power and Electricity is the basic infrastructure for economic development of a country. The degree of economic growth is highly correlated with the generation and consumption of electricity.

In Mizoram, regardless of abundant hydro-electric power potential available in the State (4500.0 MW), only 0.60% has so far been harnessed. The State's power demand is presently worked out to be 107.0 MW of which the bulk of the State's power requirement is met from Central Sector Generating Station in which the share of Mizoram is 65.31MW. However, projects such as Tuivai HEP, Lungreng HEP, Chhimtuipui HEP and Mat HEP are being proposed to be taken up.

[19] http://en.wikipedia.org/wiki/Infrastructure

The category-wise consumption pattern during 2009-2010 reveals that consumption of electricity was the highest in case of domestic consumption which accounted for 68% and the lowest from industrial sector which accounts for less than 1% of the total consumption.

Total number of electric consumers as on 31st March, 2010 is 15,83,999. Number of electrified villages as on January, 2011 is 603 and balance to be electrified is 104 which are being electrified under RGGVY scheme. The per capita consumption of energy during 2009-2010 is 173.04 KWH.

2.7.2 Transport & Communications:

Six National Highways are passing through the length and breadth of Mizoram. The total length of all types of roads in Mizoram up to December 2010 is 6349.60 km and road density is 30.12km/100 sq. km. approx. This density of Mizoram road is still very low compared to the average national level of road density which is 96.57km/100 sq. km. As such, there is need for a quantum leap of investment in road sector to catch up.

The last quarter of 2001-02 saw the implementation of the Mizoram State Road Project funded by the World Bank. This project includes the main project of improving the Aizawl to Lunglei Road via Thenzawl with a couple of other projects. Moreover, there are seven on-going projects under the North East Council which are expected to be completed within 2012. In addition, there are three road projects approved and implement during the 11th Plan under the same.

2.7.3 Postal & Telecommunications

There was a decrease in the number of post offices in the past couple of years. At the end of 2008-09, the total number was 405.

However, by March 2011, the number dropped to 400. This is mainly because some post offices have been merged with the parent offices. During 2009-10, the revenue collected under the postal life insurances amounted to ₹ 57.61 lakhs and postal savings amounted to ₹ 190 lakhs. ₹ 59 lakhs was earned from sale of postage stamps during 2009-10.

The largest provider of telecommunication services in Mizoram is the Bharat Sanchar Nigam Limited (BSNL). As on February 2011, there are 6,01,169 mobile phone connection in the state while there was 5,61,917 connection during February 2010 (an increase of 6.98%). Airtel has the majority of subscribers followed by BSNL with 2,30,000 and 1,32,436 connections respectively. Moreover, under the USO fund, 705 villages are provided Village Public Telephone (VPT) with Wireless in Local Loop (WLL) and 67 villages are provided VPT with Direct Satellite Terminal (DSPT).

2.8 FINANCIAL AND BANKING INSTITUTION

At the end of February 2011, the total bank branches functioning in the state stood at 114 while there were 109 bank branches in February 2010, which is an increase of 4.59%. Up to February 2011, there are 62 branches of Mizoram Rural Bank, 29 branches of State Bank of India, 11 branches of Mizoram Cooperative Apex Bank Ltd., 2 branches each of United Bank of India and Vijaya Bank. Bank such as IDBI, UCO, BOB, PNB, Syndicate, Central Bank of India, ICICI, Axis, HDFC Ltd. and Yes Bank have one branch each. Developmental financial institutions like NABARD, SIDBI and NEDFi also have their presence in the state. The population served per branch comes to around 7858 (2001 census) in 2011 as compared to 8175 in 2010.

2.9 RURAL & URBAN DEVELOPMENT

All rural development schemes and poverty alleviation programmes are implemented through a network of 26 rural development blocks and 8 district rural development agencies.

2.9.1 IWDP: Integrated Wasteland Development Programme (IWDP) aims at integrated development of wasteland/degraded lands based on village/micro watershed plan. There are 52 projects being implemented in Mizoram, 13 projects are expected to be completed during 2010-11 and the remaining would be completed by 2011-12.

2.9.2 IWMP: Integrated Watershed Management Programme (IWMP) intends to restore ecological balance by harnessing, conserving and developing natural resources such as soil, vegetative cover and water, while at the same time, providing sustainable livelihood intervention for landless households. A total of 170 projects with an estimated cost of ₹ 946.569 crores covering an area of 6,31,046 hectare has been proposed by the state government to be taken up in a phased manner up to the 14th Five Year Plan.

2.9.3 IAY: Indira Awaas Yojana's (IAY) objective is to provide financial assistance for construction and upgrade of houses to rural households living below the poverty line. The quantum of financial assistance provided for construction of a new dwelling unit is ₹ 48,500/- and for the upgrade of an existing house is ₹ 15,000/- per unit in hilly areas. Under this programme, 1895 new houses have been constructed and 1,112 numbers of existing houses have been upgraded.

2.9.4 MNREGS: Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS) today covers all the eight districts of

Mizoram. It has generated employment for 499.322 lakhs persons (till Feb.2011). Number of job cards issued has reached 1,80,803 by the end of 2010-11.

2.9.5 SGSY: Aiming for providing sustained income to the rural poor, Swarajayants Gram Swarozgar Yojana (SGSY) enables them to cross the poverty line by forming Self Help Groups (SHG), capacity building, infrastructural facilities, subsidised credit linkage and market support. During the last three years of the 11^{th} Plan, a total of 859 Self Help Groups have been assisted through the SGSY.

In addition to all these, the state government also has taken up various schemes for community development through Social Education, Irrigation and various developmental works through the likes of BADP and Backward Region Grant Fund (BRGF).

2.9.6 Urban Development: On the urban areas, numerous schemes and developmental projects have also been implemented. This is highly needed because most of the population are residing in the urban areas. It has taken up the JNNURM under which the state government is implementing the renovation of Greater Aizawl Water Supply Schemes Phase-I (GAWSS-I), construction of housing for economically weaker section (EWS) in four locations at Aizawl. Moreover, under the Integrated Housing and Slum Development Programme (IHSDP), the government is undertaking construction of 1950 dwelling units in Lunglei, Champhai, Kolasib, Saiha, Serchhip and Mamit. Renovation of Greater Lunglei Water Supply and Greater Serchhip Water Supply is also been taken up under the Urban Infrastructure Development Scheme for Small and Medium Town (UIDSSMT) Scheme.

On the employment frontier, Swarna Jayanti Shahari Rozgan Yojana (SJSRY) was launched in 1997 to provide gainful employment to urban unemployed or under-employed through setting up of semi-employment venture of provision of wage employment. Under this scheme, as many as 1143 and 1150 BPL families were upgraded to APL status during 2008-09 and 2009-10, respectively.

C H A P T E R - 3

REVIEW OF LITERATURE

A research consists of a thorough review and survey of related literature forms and deals with the critical examination of various published and unpublished works related to the present study.[20] This chapter examines previous studies that are related to bamboo, processing units and to that of bamboo processing industries. It highlights what has been done on related issues; lessons learnt and identify critical gaps existing.

In view of the exhausting natural resources in the modern world, there arises a need for an alternate for exploitation. The alternate comes in the form of bamboo. Since eco-friendly products have a vast potential, these bamboo based products have huge prospect in the market and are finding its niche in low-cost housing and furnishing. This will undoubtedly generate vast urban and rural employment opportunities.

Although bamboo and its processing are fairly new but emerging sector in India, the utilisation of bamboo has a very long history in the world, particularly in Asian countries and also in Africa and Latin America, where it was available as the main plant and was used as a substitute for wood in many cases. In Kerala, India village based bamboo industries were set up which utilised bamboo from nearby forests or home yards.[21] Traditional bamboo products include paper, construction and housing materials, household tools, handicrafts, furniture, weavings, carvings, and boats.

[20] Verma, S.P. (2006) *Practical Approach to Research Methodology*, Akansha Publishing House, New Delhi.
[21] Blowfield, M., E. Boa, and U.M. Chandrashekara (1995) *The Role Of Bamboo In Village Based Enterprises*, Kerala Forest Research Institute, Peechi Kerala.

Awadh[22] studied the potential of bamboo and its processing, its viability and potential towards employment and environmental conservation. It was founded that bamboo does possess many a varied uses that can prove beneficial for the economy. It was also concluded that bamboo micro enterprises are a promising source of income and that bamboos in general also have potential in environmental conservation.

An Assistant Engineer of the China National Forest Product Industry Corporation, Song Yan[23] reported the different types and uses of bamboo plywood and prospects of such bamboo plywood industries of China. A new generation of bamboo plywood formwork emerged in the building industry as a substitute for timber, steel and wooden plywood formwork that features durability, high strength and rigidity, water and corrosion resistance, easy release, low cost, and great marketing potential. Such bamboo products as carriage floorboards, container floorboards and packing boards have wide industrial use. Bamboo plywood is exported to Japan, the USA, Hong Kong and Taiwan. With favourable prospects for further development both at home and abroad, bamboo products is deemed to become one of the leading commodities for foreign exchange earnings in the forestry sector. One of the main uses of bamboo plywood is in the architectural cement formwork which is a new generation of formwork succeeding steel and wooden plywood and incredibly popular in the construction industry because of its superior properties. It is further stated that bamboo plywood floorboards are used in the majority of coaches and railway carriages. The number of coaches and carriages manufactured

[22] Awadh, Asma Hadi (2010) *An Assessment of the Viability and Potential of Bamboo Micro Enterprises in Environmental Conservation and Poverty Alleviation in Nairobi City, Kenya*. M.Sc Thesis.
[23] http://www.fao.org/docrep/x5336e/ x5336e0im.htm

with bamboo plywood flooring has reached nearly 10,000 annually, which reflects the fact that bamboo plywood has significant economic and ecological advantages over some traditional materials such as timber and steel. In addition, bamboo-packing board is a major product manufactured by many small-scale bamboo plywood plants in China. It is mainly used for packing mechanical and electronic equipment and materials. In recent years, the bamboo plywood industry has benefited from relaxed regulations concerning the use of bamboo for packing crates.

Ongugo et al.[24] identified potential development interventions for the improvement of the livelihoods of the local people in Kenya. Bamboo was identified to be an environment enhancing grass with potential of rejuvenating degraded land. The study was done in the rural and semi-urban areas. The conclusions of the study were however drawn from the rural perspective, and was founded that bamboo indeed enhances rural livelihoods. It also highlighted the need to undergo research on the development of bamboo processing units in urban areas.

International Network for Bamboo and Rattan (INBAR) reported on studies it has done in Asia, Central and South America that have indicated bamboo advantages from a livelihood perspective. The advantages include first, it can be harvested annually and non-destructively. However, clear cutting is detrimental to the stands but selective harvesting increases productivity. Secondly, bamboo establishes quickly with the first harvest generally available in 3-4 years or in some cases even in two years. Stand maturity is generally reached in 5-6 years at the most. Thirdly, the investment required for

[24] Ongugo, P.O., Sigu, G. O, Kariuki, J.G, Luvanda, A. M, Kigomo, B. N. (2000) *Production to Consumption Systems: A Case Study of Bamboo Sector in Kenya*. INBARs Bamboo and Rattan Development Programmes Kenya Forestry Research Institute Nairobi.

establishing a bamboo plantation is quite low compared to most commercial tree species. Lastly, the plant regenerates itself and continues to yield for long periods, dozens of years in most cases and often up to 50 or 70 years.

In his study, Abdulaziz[25] reported on the impact of bamboo economy on poverty alleviation in Ileje District, Tanzania. The results show that bamboo trade was a strategy to alleviate poverty, which had manifested in the region. The immediate outcome of this strategy has been poverty alleviation among households engaged in bamboo trade. The bamboo goods were exchanged with commodities like rice, beans and millet that were easily stored. Also, most households indicated that they acquired the skills of making bamboo goods by inheriting from parents and grandparents (54.2%) and others acquired through training after realizing that bamboo goods trade is profitable (45%). The most popular period for making and marketing bamboo goods is in the dry season when the agricultural activities have been reduced to a minimum. Abdulaziz revealed that bamboo trade is employing a reasonable proportion of the population in Ileje District and it is a good source of income that helps to alleviate poverty in the district. The study was done in a rural setting in Tanzania; however, there is need to research on whether bamboo products can alleviate poverty in urban areas.

Many countries have large bamboo resources in public forests; while others could easily cultivate bamboo resources either as a new plant or by reintroducing threatened native species.[26] INBAR indicated that livelihood strategies for the rural poor often include the use of bamboo for housing, utensils, and the collection of bamboo

[25] http://ippmedia.com/ipp/guardian/2006/10/28/77280.html

[26] Sharma,Y. L. M., (1980) "*Bamboo in the Asia Pacific Region"* 99-120. In Workshop on Bamboo Research in Asia, Singapore. (Eds) G. Lessard and A. Chorinard IDRC, Otawwa.

timber or shoots for sale all in the informal sector. INBAR also noted that most of the processing of bamboo is done at home, which is optimal for increasing income opportunities for women and children. Beyond traditional handicrafts and furniture, the weaving of mat boards, which have industrial uses, is an example of a promising activity for generating income in the home in India. However, the supply chain and market needs to be developed further. Promotion of bamboo cultivation and subsequent income generating activities by the government has boosted the bamboo sector.

According to Blowfield et al.[27] in many rural villages of India, clumps of bamboo are owned and managed by local people alongside food crop and trees. However middle-income households were more likely to benefit from bamboo farming compared to poor farmers and women. This was because poor farmers preferred to work on food crops and obtain direct benefits. As for men, they went to seek waged employment, which prevented them from working in their home gardens.

Vantomme et al.[28] stated that bamboo is a beautiful, resistant, flexible and versatile material that can be produced in an environmentally friendly, renewable and sustainable manner. There is no doubt in the many benefits that bamboo and its products can provide. In India for example, bamboo plantation projects were established as part of a development project from 1995 to 2003 on land degraded by decades of brick mining. Meanwhile, the farmers organised themselves into village based industries and benefited by selling bamboo culms and shoots from the plantations. The degraded

[27] Blowfield, M., E. Boa, and U.M. Chandrashekara (1995) *The Role Of Bamboo In Village Based Enterprises*. Kerala Forest Research Institute, Peechi Kerala.
[28] Vantomme P., N. Braulin, V. Chioetto, and W. Liese, (2003) *Public Construction Made with Bamboo: Lessons Learnt From the 'Vergiate Bamboo Pavilion' in Northern Italy*. Journal of Bamboo and Rattan Vol.2

land that had only supported grass in 1995 had been converted to bamboo plantations and some farmers had been able to resume farming on the rehabilitated soil by 2003.[29] The extensive rhizome system of the bamboos, found mainly in the top layers of soil, is valuable for its positive effect on soil stabilization and securing hydrological functions of catchments and rivers.

Bamboo micro industries have been proven to alleviate poverty and enhance the environment in many previous studies such as Jiafu in China, Abdul-Aziz in Tanzania, Blowfield et al. in India and Vantomme et al. in Italy. Blowfield et al.[30] observed that the socio-economic status of someone prior to engaging himself in a bamboo based village enterprise will determine the sustainability of the business. Middle class farmers who owned land and could plant bamboo would benefit more and were likely to sustain their businesses poor farmers who had to go seek waged employment to complement what they earned from their farms.

W. Leise[31] mentioned that bamboo is still an essential material in many countries for many purposes. He further mentioned that it has to be processed and used properly according to its biological properties. We have to be aware that the fascination of bamboo as a material has encouraged competitors for bamboo imitations from plastic. They look real, are durable and often cheaper than the original. And the old, much unjustified saying, "bamboo is the poor man's timber" is in certain quarters already rephrased as "only the rich can afford bamboo."

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[29] Kutty, . Narayan, C. (2003) "*Greening Red Earth – Bamboo's Role in the Environmental and Socio-Economic Rehabilitation of Villages Devastated by Brick Mining,"* INBAR, Beijing.
[30] Blowfield, M., E. Boa, and U.M. Chandrashekara (1995) *Op. cit.*
[31] Leise, W. "*Anatomy and Utilization of Bamboos"* in Shanmughavel, P., Peddappaiah, R.S & Leise, W (2003), Recent Advances in Bamboo Research, Scientific Publishers, New Delhi.

The former President of India, A.P.J Abdul Kalam[32] in his Presidential Address on the eve of the country's 56th Republic Day, 2005 speaks highly of a bamboo mission which envisages the cultivation of bamboo over two million hectares and promotion of technology and networking for enhancing trade. He further stated that economic and social benefits from these activities will lead to the creation of 8.6 million jobs and market opportunities worth over ₹ 6,500 crore with an investment of ₹ 2,600 crore. He believes that this will be useful for the additional development of the North-Eastern region.

Salam,[33] the Director of CBTC, Guwahati, stated that there are enormous environmental and socio-economic implications and benefits in processing of bamboo to produce mat boards. It was estimated that if bamboo mat boards replace 1/4th of plywood, it can save 4,00,000 cubic metres of round wood, thereby preventing the disturbance to 30,000 hectares of forests per year. Furthermore, it will generate 16.7 million workdays of employment per year.

The Environment and Forest Department[34], Govt. of Mizoram in its publication '*Bamboos of Mizoram*' stated that the growth and productivity of naturally occurring and introduced species is quite good in Mizoram. They further stated that it can be further improved by undertaking good management practices. However, due to lack of bamboo-based industries in the State, the demand for bamboo is low. It is also mentioned that there is an urgent need to establish bamboo processing industries such as bamboo based roofing sheets, panelling and floor tiles, bamboo charcoal and activated carbon to make proper

[32] http://www.abdulkalam.com/

[33] Salam, Kamesh, *Bamboo for Economic Prosperity and Ecological Security with Special Reference to North-east India*. (https://www.indianfolklore.org/journals/index.php/Ish/article/.../520)

[34] Government of Mizoram (June 2010) '*Bamboos of Mizoram*' Environment and Forest Department

use of the bamboo resources of the State as well as to provide employment opportunities to the people.

Talking to the Hindu Business Line, the then chairman of the Shellac and Forest Products Export Promotion Council (Shefexil), Mr Pradeep Kr Shaw in 2007 stated that on dwelling upon the market potential of eco-friendly bamboo-based products, it now finds wide applications in items such as low-cost furniture and housing with high potential for rural employment.[35] Viewing it as such, Shefexil took up projects revolving around minor forest produce like the bamboos of Mizoram and Tripura. The bamboo scheme was targeted at as many as 15,000 beneficiaries, ensuring an annual income of ₹ 25,000 per beneficiary. The primary objective was to help raise Indian exports of value-added bamboo production in the country by 300 per cent by 2011, and also provide rural employment in a big way. Thus, it is clear that bamboo processing industry is a very important sector which will bring about all-round development to the economy of Mizoram.

P.B. Lalrammawia,[36] in a local newspaper, stated that the repeatedly mentioned quote - it is an advantage Mizoram is abundant with bamboo that we can develop with - is being made true by the Zonun Mat Ply (P) Ltd. by exploiting the copious domestic bamboo resource by manufacturing ply and mats. He supplemented that the industry in addition to creating employment for many households, has been able to export their renowned products to other states of the country as well.

As already mentioned, the bamboo processing industries or any industry in Mizoram at present is of the small-scale type. So, the

[35] http://www.thehindubusinessline.com/todays-paper/tp-economy/article1645942.ece
[36] Lalrammawia, P.B. "*Zonun Mau"* in The Zozam Weekly Sept. 19, 2010.

review would not be complete without the examinations of small-scale industries.

Rastogi[37] made a case study of Madhya Pradesh and concluded in the favour of only small scale and village industries, which made optimum use of indigenous techniques and local resources. According to him, there are hundreds of items which can be produced in cottage and small scale industries more economically than in large industrial sector.

Hamid[38] revealed that small scale industries play an important role in the development of hilly areas. He found that in a hilly state like Jammu and Kashmir, the economy is hardly ideal for developing large scale industries and so, the only remedy lies in the establishment of small scale and cottage industries. These are more suited to the socio-economic condition of the state. The identified causes of industrial backwardness like that of peculiar geographical location, shortage of imported raw materials, inadequate and irregular power supply, insufficient central investment, poor technical know-how, etc., also prevails in Mizoram leading to slow industrial growth.

Desai[39] stated that rapid industrialisation in India depends on the growth of small scale industries. Most of the small scale industries are operating under certain handicaps like shortage of raw materials, low levels of technical knowledge, poor infrastructure, inadequate capital and credit facilities, improper distribution system, lack of facilities for market analysis, etc. They are also weak in marketing

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[37] Rastogi, K.M. (1980) *Employment Generation Through Small-Scale, Village and Cottage Industries- A Case Study of Madhya Pradesh'* in Narayana D.L. (ed.) Planning for Development, Sterling Publishers Pvt. Ltd. New Delhi.

[38] Hamidm S.A. (1989) *Management and Development in Small Scale Industries*, Anmol Publications, New Delhi.

[39] Desai Vasant (1983) *Problems and Prospects of Small Scale Industries in India*, Himalaya Publishing House, Mumbai.

their products beyond their localities especially in international markets.

Prasad[40] in his study found that small scale industrial sector is an integral part of not only the industrial sector, but also of the country's economic structure as a whole. If small scale industries are properly developed, they can provide a large volume of employment, raise income and standard of living of the people in lower income group and can bring about more prosperity and balanced economic development.

Literature on the present topic of small scale industries of the state is scantily available. However, the writings of A.K. Agarwal, Rualkhuma Colney and Thangmawizuala cannot be ignored.

Agarwal[41] mentioned that the entrepreneurs of small scale industries are generally lacking in knowledge of various aspects as how to set up an industry. He further stated that in addition to lack of industrial tradition and managerial class, the state is handicapped by difficult terrain and disturbed a socio-political condition which adversely affects industrialisation in Mizoram.

Rualkhuma[42] focused on the industrial development of Mizoram. Although it is of a geographical interpretation of existing bottlenecks and problems rather than an economic analysis, he gave much importance on the development of small scale and village industries which will boost the overall economic development of the region.

[40] Prasad L. (1983) *Industrialisation – Concepts and Issues, S. Chand and Co., New Delhi.*
[41] Agarwal, A.K. (1999) "*Industry in Mizoram"* in Banerjee, A. and Kar, B. (ed.) Economic Planning and Development of North-Eastern States, Kanishkha Publishers, New Delhi.
[42] Colney, Rualkhuma (1997) *Small and Cottage Industries in Mizoram*, LL.B. Associates, Aizawl.

Thangmawizuala[43] is of the opinion that the setback in the progress of industries in Mizoram is because of political disturbances particularly of the insurgency in Mizoram. According to him, the existing small scale industrial units could not make the desired progress due to these disturbances. The main hindrances for industrial development in the state are lack of good communication facilities, financial difficulties and the absence of market outlets.

On studying about industrialisation in Mizoram, Laskar[44] concluded that even though the industrial sector is deprived of its due attention from the government at the private level, there are small scale industries which have put up examples of success in their respective fields. He further noted a few names of such industries in which the Zonun Mat Ply Pvt. Ltd. was cited among the most successful ones. It is doing well not only in catering to local needs but also exporting outside the state and also participating at international trade fairs. This is a great source of inspiration and encouragement to the new generation entrepreneurs. Moreover, he stated that Mizoram is endowed with vast forest resource which can be utilised to speed up industrialisation. The major forest resource, bamboo, should be given due importance by the Government and set up bamboo-based industries to manufacture products such as bamboo panel, bamboo ply, particle board, mat ply, etc.

Bamboo being a multipurpose, eco-friendly crop abundantly available, yet an underutilised natural resource, needs to be managed and exploited for sustainable use. The Bamboo Policy of Mizoram,

[43] Thangmawizuala, H. (1985) *Economy of Mizoram.* Seminar on 'Tribal Economy of NER' Spectrum Publications, Guwahati.
[44] Laskar, Baharul Islam (2010) *Industrialisation in Mizoram Problems and Prospects*, New Central Book Agency (P) Ltd. Kolkata.

2002[45] stated that bamboo is conceived as a thrust area in the industrial development of Mizoram for the economic and ecological security of the people. This precious resource needs to be fully tapped as an Industrial raw material, as substitute for wood in rural/urban housing, engineering works, handicrafts, furniture and value addition through export. Undoubtedly bamboo can revolutionise the economy of the State ensuring employment opportunities to a large number of people. Extension and awareness about bamboo sector development will be given a renewed thrust.

[45] Government of Mizoram (2002), *The Bamboo Policy of Mizoram, 2002*.

C H A P T E R - 4

POTENTIAL OF BAMBOO PROCESSING INDUSTRY IN MIZORAM : OPPORTUNITIES AND THREATS

Bamboo has been traditionally used from time immemorial. Many people's experience of bamboo products is limited to sitting on bamboo furniture and matting, using bamboo baskets or using bamboo chopsticks to eat some bamboo shoots. The last 15 years has seen a dramatic growth in the variety of commercial bamboo products such as flooring, laminated furniture, building panels, high quality yarn and fabrics, activated carbon and bamboo extracts. The emergence of bamboo as a timber substitute has coincided with a growing demand for timber. Bamboo's appearance, strength and hardness combined with its rapid growth cycle and capacity for sustainable harvesting make it an increasingly attractive wood substitute. The market outlook for bamboo is strong.

These recent development have created new opportunities for bamboo markets to be targeted for rural development and poverty reduction. In particular, the emergence of near-source value-adding in modern supply chains increases the sector's potential economic impact on poor rural communities.

4.1 COMMERCIALLY IMPORTANT BAMBOO SPECIES

There are a number of genuses of bamboo though they all belong to the same botanical family. Even though there are about 550 species of bamboos in the world, all the species are not commercially important. It is therefore important to identify those species which can produce products possessing commercial importance. The commercially important ones are:-

Aundinaria auea, Aundinaria auricoma, Aundinaria chrsantha, Aundinaria deblis, Aundinaria falcate, Aundinaria falsineri, Aundinaria fortunei, Aundinaria hindbii, Aundinaria hookeriana, Aundinaria humilis, Aundinaria japonica, Aundinaria macrospermae, Aundinaria mormosa, Aundinaria narilisa, Aundinaria noblis, Aundinaria pumila, Aundinaria simomii, Aundinaria teeta, Aundinaria tessilato, Aundinaria veifchii, Bambusa angustifolia, Bambusa arundinaria, Bambusa auea, Bambusa aureo variegata, Bambusa castillinois, Bambusa chrysantha, Bambusa disticha, Bambusa ereda, Bambusa falcate, Bambusa falsineri, Bambusa fastuosa, Bambusa gracilis, Bambusa henonis, Bambusa mormoso, Bambusa maximi wicxii, Bambusa mazati, Bambusa metane, Bambusa metis, Bambusa nana, Bambusa narilisa, Bambusa nigra, Bambusa palmate, Bambusa pumila, Bambusa pyamaceae, Bambusa quangulleris, Bambusa qullitoi, Bambusa ragamoskil, Bambusa rusafolia, Bambusa tulda, Bambusa veifchii, Bambusa vilmorinii, Bambusa viminalis, Bambusa violes canus, Bambusa vridiglance scons, Bambusa vridistriata, Bambusa virdis, Bambusa vulgaris, Dendrocalamus hamiltant, Dendrocalamus latofolia, Dendrocalamus membrauceus, Dendrocalamus strictus, Psendostachoyam auea, Psendostachoyam castyillinois, Psendostachoyam henonis, Psendostachoyam kumasoca, Psendostachoyam metis, Psendostachoyam punctata, Psendostachoyam qullitoi.

Fig. 4.1 Bamboo clumps sold in the local market (pic : Ruatfeli)

In spite of the fact that the above mentioned species are declared as commercially important species on the basis of certain studies and reports, it does not mean that other species are not important. In fact, if tradition of each bamboo growing countries is studied, many other species may be found commercially useful in much respect provided that they are processed properly and final products are placed appropriately in the commercial market. Therefore, the list is only indicative.

4.2 BAMBOO CRAFT IN THE SEVEN SISTER STATES OF NORTH-EAST INDIA

Bamboo sector in general and bamboo processing in particular remained as a neglected sector in our country. Only way bamboo could sustain was because of paper mills and the paper mill lobby was too strong for the processing sector to fight.

Bamboo has a natural habitat in most regions of the country. According to some estimates, India has 30 per cent of the world's bamboo resources, but contributes only four percent share of the global market. This is mainly because of low productivity. Bamboo is a vital element of India's North-Eastern states that are often collectively called the Seven Sisters.

The Seven Sister States also called 'Paradise Unexplored' comprises of the contiguous states of Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura in north-eastern India. These states cover an area of about 250,000 sq. km. or about 7 percent of India's total area. Although there is great ethnic and religious diversity within the seven states, they also have similarities

in political, social and economic contexts.[46] Most of them are of the Mongoloid culture.

Mongoloid culture has been described as the bamboo culture. For them, the slogan has to be 'eat bamboo, sleep with bamboo, live with bamboo and drink with bamboo.' The significance of bamboo with these states is given below:

4.2.1 Arunachal Pradesh:

Arunachal Pradesh occupies an important position among the bamboo bearing states of India. Bamboo forms a major constituent of the forest vegetation. Arunachal Pradesh has about 46 bamboo species. Moreover, since all the tribes that reside in the state belong to Mongolian group, bamboo remained as their principal craft. Bamboo industry of Arunachal Pradesh is of very high standard. It holds utmost importance in meeting most of the domestic requirements of the people of the state. Different sizes and shapes of hats, various kinds of baskets, cane vessels, a wide variety of cane belts, elaborately woven brassier of cane and fibre, bamboo mugs with carvings, a variety of ornaments are some of the special products of this industry. Out of these, the top most attraction is the baskets of the state, which are beautiful not only because of the fine texture but also because of the unusual shapes. Moreover, bamboo ply industries are also set up and running here. Recently, a formerly closed plywood unit re-entered production, with a range of bamboo composite material, and pre-fabricated structures. In addition, expansion and modernisation of an existing ply unit has been taken up to manufacture bamboo plywood as well.[47] The proposed expansion and modernisation plan would induct required bamboo processing machineries and technology for

[46] http://en.wikipedia.org/wiki/Seven_Sister_States
[47] http://www.bambootech.org/subsubTOP.asp?subsubid=145&subid=37&sname=STATE

flattened bamboo board (with or without bamboo on mat) and would increase the capacity of production of unit to viable scale.

4.2.2 Assam:

Bamboo has played an important part in the lives of the people of Assam, and has been an integral part of the cultural, social and economic traditions of the State. It is a renewable and versatile resource, and an important component of the wealth of Assam. Assam is well-endowed with bamboo resources. With a wide range of forest types, the state's area continues to support over thirty species of bamboo, excluding exotics. Most of these species are commercially significant and through new perspectives on cultivation and management are capable of supporting the needs of industrial and value added applications. The decline in the availability of timber and the emergence of new technologies and product options has spurred interest in the field of wood substitutes and composites. These include boards of different types - mat, corrugated, laminated, particle, wafer and chip. Some products provide promising linkages between the organized and unorganized sectors, between household activity and organized industry. The Government of Assam has taken up various steps to promote support to the development of the bamboo sector in a comprehensive manner, through a multidisciplinary multi-departmental and multi-dimensional integrated approach to provide economic benefits to the people of the State.[48]

4.2.3 Manipur:

In Manipur, bamboo has been an integral part from time immemorial down to the present day. 15 species of bamboo – two varieties of *Arundinaria*, six varieties of *Bambusa*, four varieties of

[48] http://assamgovt.nic.in/policies/bamboo&cane_policy.asp

Cephalostachyum, one variety each of *Dendrocalamus*, *Melocalamus* and *Melocauna* are found. Keeping in tune with the different varieties of bamboo, craftsmen make different articles and implements using different techniques and varied forms. Currently, most of the bamboo artisans of the state of Manipur remain at traditional skilled levels and are unable to produce according to the market demands. However, the sector has enough scope to generate sufficient employment opportunities.

Efforts have been made by the Department of Commerce & Industries, Government of Manipur, to upgrade the skills of the bamboo artisans by organising training programmes inside and outside the State. This Department has taken up various activities for promotion of bamboo-based industries. It granted a set of bamboo machinery and equipment worth ₹ 9 lakhs to three selected Non-Government Organisations (NGOs) to run Common Facility Centres (CFC) for Bamboo-Based production. Moreover, recognising the resources of bamboo in the state of Manipur, in general and Jiribam of Imphal East District in particular, the Govt. of Manipur is planning to set up a bamboo technology park at Jiribam. With an aim to upgrade the skills of the bamboo artisans a bamboo technology course is being introduced in the existing Departmental Arts and Crafts Training Centre, Thoubal.[49]

4.2.4 Meghalaya:

Meghalaya is richly endowed with the bamboo forests. Its abundance and multiple uses have led bamboo to play a pivotal role in the socio-economic and cultural life of the tribal people of the state. It finds varied uses like construction material, in making of diverse

[49] http://dcimanipur.gov.in/bamboo.html

implements for agriculture, fishing and cattle rearing and the simple household items like utensils, small furniture, etc. Livelihood of a significant population in the state is dependent on the handicrafts made of bamboo. It has been reported that 36 species of bamboo from 14 genera are found in Meghalaya. The tradition of bamboo craft in Meghalaya is very rich like that of the other states mentioned. Since most of bamboo forests of the state are under the control of Autonomous District Councils (ADC), people harvest bamboo from the areas belonging to their respective communities. The harvested bamboo is used for making handicrafts, selling bamboo poles in the village and city markets and selling bamboo as raw material to the paper mills located in the adjoining state of Assam. However, these activities fall in the un-organised sector and no statistics to indicate quantum of material or its value in monetary terms is available. There are four bamboo based industrial units in the state. The state of Meghalaya has a lot of potential for growth of bamboo processing industry and its products can take on to global market provided that proper design and quality control facilities are in place.

4.2.5 Mizoram:

Like that of the other north-eastern states, bamboo plays a major role in the life and culture of Mizoram. It is so important that even their important dances are associated with bamboo. There are over 20 known species of bamboo in Mizoram. It has been used extensively in agriculture, construction, handicrafts, transportation, micro enterprises and in industry. Although in its nascent stage, the bamboo industry in Mizoram has been experiencing remarkable growth over the years.[50] Mizoram invites prospective private investors and FDI for setting up

[50] http://kaladan.com/111/mizoram-bamboo-industry-experiencing-remarkable-growth/

of industrial units for making bamboo chips, bamboo mat ply, toothpicks, bamboo blinds, chopsticks, incense stick (agarbati) either in joint venture with Mizoram Bamboo Development Agency or other with local entrepreneurs.[51]

4.2.6 Nagaland:

In Nagaland, bamboo forest covers around 4,48,000 hectares and is about 5% of the growing stock of bamboo of the country. It is an important resource in the socio-economic-ecological-climatic-functional context for Nagaland and the state has now taken a step in the initiative to harness the potential of bamboo and its benefits. Nagaland Bamboo Development Agency (NBDA) was established to undertake the programmes and activities of bamboo with the objective to foster in ecological security and economic growth through development and utilisation of the bamboo resources. It strive to evolve scientific management practices for naturally occurring bamboos and plantation bamboos to improve productivity and harvesting and set up appropriate institutes for research and development of bamboos, both for regeneration and industrial processing and value addition. In addition, the Government of Nagaland set up policies and action plans that focus on value added products and wood substitutes such as ply, flooring tiles, shuttering etc. Moreover, it strives to promote and develop traditional usage of bamboo.[52]

4.2.7 Tripura:

Often called the 'home' of bamboo, bamboo based economic activities are an intrinsic part of the people of Tripura. The importance of the resource in the state's predominantly agrarian economy is well

[51] http://investinmizoram.nic.in/foi/bs.htm
[52] http://www.bambootech.org/subsubTOP.asp?subsubid=105&subid=37&sname=STATE

recognised. Bamboo finds many uses, and is a major source of income and employment as well. It is estimated that 2.46 lakh families in the State are engaged in bamboo related vocations. There are as many as 21 species found here.[53] Tripura bamboo handicrafts are considered to be among the best in the country for their exquisite designs, wide range of products and artistic appeal. This industry has a great export potential as well. Not only that, industrial products like bamboo tiles, laminated products, ply boards, corrugated sheets, etc., can be produced and used as building materials for furniture manufacture etc. Studies have shown that bamboo is a very effective substitute for timber and is, in fact, better in many respects.

Therefore, the north eastern region is a region which is abundant in bamboo resources. The region houses about two-thirds of the bamboo resources of the country spreading over an area of about 3.10 million hectares where 89 species of bamboos are available. This invaluable gift of nature to the region is integral to life and culture of all the ethnic groups of North-eastern India. Its multipurpose uses have made it an indispensable resource for the rural people. Being interwoven with the daily life of the ethnic groups, it has been incorporated in their cultural and social occasions also. Efforts backed by a surge in people oriented policies by the State Governments of the Region have begun to bear fruit. Bamboo being a principal natural resource, the people of the region in particular will be better served by this God given bounty, if we all get down to the task of economic taming of this resource. A look at the facts reveal that sustainable and economic utilization of bamboo will throw open a plethora of opportunities, especially for the rural poor. Continued technological advancement and research have put bamboo into more and more uses

[53] tripuraindustries.in/bamboo.htm

and as a raw material for several industries. A priority requirement for harnessing its economic potential would be to draw up a well coordinated multilateral approach. The raw stock of bamboo in the Region is conservatively valued at ₹ 5,000 crores. Even with a modest target of two-fold value addition to the stock through suitable methodologies, an annual turnover of approximately ₹ 10,000 crores can easily be generated in the Region.

4.3 LESSONS FROM CHINA

China's forested area ranks fifth in the world, with forest resources covering 175 million ha, including 4.84 million ha of bamboo (2.86% of the total forestland). The state owns 42% of China's forestlands, with the remaining 58% owned by rural collectives (either owned by the township, village or sub village). Collective ownership dominates bamboo forests with 93.4% of the total bamboo forestland area or 4.52 million hectare.[54]

Bamboo has a long tradition in China as both a commercial and a subsistence-level product. It is making an increasingly large contribution to farmers' incomes and the prosperity of county level economies and therefore plays an important role in rural development. However, the importance of bamboo has long been ignored. It has been viewed as a minor forest product, receiving limited financial input, and no specific planning for bamboo development at national levels in China. Facing a shortage of timber supply after the adoption of logging bans in natural forests in 1998, bamboo development was finally recognised by the government as an ideal substitute for timber and potentially a tool for poverty alleviation. China transformed and

[54] SFA (State Forestry Administration of P.R. China). 2005. National Forest Resources Report. Beijing, China.

established its bamboo base up to 4 million hectares, of which 3 million hectares would be transformed from the inferior bamboo forest and 1 million would be established as plantations. Furthermore, the Ninth Five-Year Plan and 2010 Long-Term Plan for the Development of Forest Science and Technology included a key research project to improve technology for processing bamboo culms.

With rural economic reforms and market liberation, the bamboo sector has undergone great changes and become increasingly important. Although bamboo represents only about 3% of China's total forest area, it now contributes 25 percent of total forest exports. In 1999, the value of bamboo production amounted to $1.47 billion and the value of the bamboo industry sector reached $1.32 billion, with total exports of $272 million in 1999.

Nowadays, China's flourishing bamboo industry is becoming one of the pillar sectors in the country's forestry industry and also a key in the country's efforts to establish a low-carbon economy. With 5.38 million hectares of bamboo plantations and an annual increase of 100,000 hectares, China is leading the world's bamboo industry in its number of varieties, amount of bamboo reserves, as well as production output.[55] The Chinese government is also working to develop its bamboo industry to meet its goals in environmental protection and green economic development, as planting bamboo is both profitable and environmentally-friendly.

To promote the development of the bamboo industry, China has encouraged technological innovations. New processing techniques have led to a variety of new bamboo products, such as raw bamboo, daily-used goods, artifacts, plates, and bamboo charcoal, which are

[55] Xiang, Zhang (2010) *China's Bamboo Industry Booms for Greener Economy*, available at http://news.xinhuanet.com/english2010/china/2010-07/18/c_13402777.htm

widely used in different sectors ranging from construction, packaging, transportation, medicine to tourism. Moreover, a further opening up of the international market also helped to boost the industry. Health-care products and artificial plates made of bamboo were well received in Southeast Asia, Europe and America.

China's bamboo industry has provided more than 35 million jobs, making the sector part of the new drive in the economic development of the world's largest agricultural country. The bamboo sector chalked up 70 billion yuan (10.33 U.S dollars) in total output value last year.

However, even the bamboo processing industry of China is not free from problems and challenges. The imbalance of regional development, insufficient use of certain species and low productivity had left many resources untapped. Most of the bamboo manufacturers are small-scaled. Those with an annual production of over one million yuan only account for 8 percent of the total industry. The establishment of a high-tech industrial chain to enhance efficiency within the bamboo sector with more encouragement for technology innovation and an optimization of the production structure may be called for.

Land tenure reform has always been a priority issue to the Chinese government for the sake of the stability of rural society and the well being of the farmers. Since the collectivisation under Communist rule in the 1950s, the government has enacted a series of land reforms intended to increase productivity while ensuring fairness. The results have not been particularly successful.

Forestland in China is either owned by the state (national government) or collectives. Private land ownership has not existed since the collectivization policy that began in the 1950s. However,

land tenure reforms in the late 1970s shifted rural households, and thus individuals gained much greater control over management of forestlands, although legally the village collectives still owned the land. The state forests own 68% of the total standing volume, but collectives own 58% of the forestland. Collectives dominate the area and volume of plantation forests, while state forests are primarily composed of natural forests.[56]

4.4 LESSONS FROM JAPAN

The chapter would be incomplete without mentioning about Japan. Japan is very advanced in the processing of bamboo than any other. More than a hundred varieties of bamboo are grown. From bamboo alone, the Japanese manufacture 1,400 articles in their home factories, which amount more than 14,000. Bamboo chairs and bamboo made radio sets are unique in artistic beauty. Bamboo for export find expression in endless varieties of excellent Japanese handicraft baskets, knives, smoking sets, chop sticks, tiles, plywood, walking sticks, knitting needles, etc. It also plays an important role in Japanese architecture as it is often used as an imposing pillar before the alcove, the sacred place in a Japanese house. It is also used for all kinds of furniture which is far more beautiful than wooden furniture.

Production is mainly labour intensive i.e., 95 percent and by machines 5 per cent. Production of bamboo amounts to over an average of a million bundles per year. The National Government, the Prefectual Governments and City Governments of Japan have research centres for each industry or group of industries which process bamboos. All these centres employ technicians, workers and artists.

[56] SFA (State Forestry Administration of P.R. China). 2005. National Forest Resources Report. Beijing, China.

They continue research in the respective industries and create new designs and patterns. Moreover, they conduct seasonal training courses and train the artisans in improved methods of production, marketing, etc. The research centres play a prominent role in the development of middle and small-scale industries. Nothing of this kind is being done for the bamboo processing industry in India.

Plantation and processing of bamboo in Japan are well-planned and done meticulously. The bamboos undergo high frequency bending, dyeing, carbonisation, etc. Bamboo plywood is a great industry in Japan and tiles and ceiling materials made from bamboo are artistic. Fortunately, attempts have been made in India recently to produce bamboo plywood and tiles up to limited extent. Since it has been accepted commercially, hopefully this industry may prosper.

On analysing the bamboo sector of both Japan and India, it is found that the Indian system is exploitative while the Japan bamboo industry moves in a systematic manner. In India, the research priorities on bamboo are to help paper mills only and rayon plants and craft persons are totally ignored. Even plantations are planned according to the desire of the mill owners. In Japan, it is just the opposite.

Japan is an ideal example to learn lesson that even crafts can be produced with high value to dominate global market. The system ensures fair earning for craft persons. We in India need to learn the total system to implement bamboo-based programme.

4.4 OPPORTUNITIES AND THREATS

Though unique in its own way, bamboo processing industry, with its background, is necessary to assess whether it is worth going ahead spending so much of energy, time and money.

Bamboo as material is considered as one of the most dynamic and flexible material suitable for manufacture of several types of products. It is considered as renewable source and hence its products may be considered as eco-friendly. Therefore, there are immense opportunities for growth of bamboo processing industries in Mizoram. First is of the availability of raw material. As already mentioned, Mizoram is abundant with bamboo. Setting up of a processing industry will lead to utilisation of the untapped natural resource in which there is possibility to produce value added by products thus possessing inner strength to ensure economic growth.

Environmental awareness has created greater opportunity for bamboo. Since bamboo products are eco-friendly, attention has been drawn on bamboo products with formation of an international organisation called INBAR that gives support, encouragement and awareness on bamboo sector. Hence, there is immense opportunity for further growth. Moreover, the Government of India, encouraged by INBAR, has also come up with Bamboo Mission and as such, there is possibility of additional support.

In addition, in a bamboo processing industry, involvement of economically and socially backward classes is fairly large. As such, setting up of such an industry will produce bamboo products on one hand and upgrade those backward classes on the other. This will probably draw the attention of international organisations like UNDP, UNIDO, UNESCO, World Bank, etc. with their support including finance. It also matches government schemes with social objective perfectly.

Use of bamboo mat, ply etc. is gaining popularity as material for construction and interior decoration as well. This is the case in the urban areas of Mizoram more than the rural areas. Therefore,

opportunity of use of bamboo products is also on the rise leading to wider market prospects for processed bamboo products.

Along the same line, a relevant point that needs to be noted among the potentialities of bamboo processing industry in Mizoram is of the rising demand for ethnic products. With this rising demand, there is immense opportunity for rise of demand of bamboo products. Furthermore, since there are varieties of bamboo species, varieties of product mix are possible with proper scientific inputs with will attract the domestic and foreign consumers.

On the other side, setting up of a bamboo processing industry can face numerous threats. This is evident because the sector is not growing. One of them is the policy implementation and policy changes in government machinery. Such policies include tax policies, preferential policies and implementation of programme even opposite to declared policy of the government. In addition, paper mill lobby consume bulk of the bamboo and are an organised lot armed with money and power. With blessing of bureaucracy and political forces, they may ensure failure of bamboo programme since rise of bamboo industry will deprive them their raw materials which are now available to them at throw-away price.

Moreover, bamboo processing industry in Mizoram may also face hardships from external trade. Superior bamboo items at cheap rate from Japan, China and other parts of the India are flooding the market threatening bamboo products of Mizoram.

C H A P T E R - 5

ZONUN MAT PLY (P) LTD:

AN EMPIRICAL ANALYSIS

Zonun Mat Ply (P) Ltd. was set up in April 24, 1992 under Companies Act, 1956 with a view to promote bamboo based industry and to tap the abundant bamboo resources in the state of Mizoram. It has its registered office at A-20, Zarkawt, Aizawl, Mizoram and manufacturing unit located at Lengpui, (near Tourist Lodge) Mizoram. The industrial site covers a land area of about 20 hectares in which there are quarters built for workers to reside in addition to the factory in which processing of bamboo is being done. The mission of this particular bamboo processing industry is to maximise utilisation of the available natural resource of Mizoram, namely bamboo.

5.1 THE INDUSTRY

As the name suggests, Zonun Mat Ply (P) Ltd. is a private enterprise run by an entrepreneur. It started its commercial production in 2004. In addition to domestic market, the Industry has been able to export its products to other states of the country like Goa, Delhi, Bangalore, Kolkata and Guwahati among others. Moreover, the Industry supplied its ply to the 2004 tsunami-hit victims through the Tsunami Rehabilitation Programme (TRP) in the Andaman and Nicobar group of islands in 2006. Currently, the Zonun Mat Ply (P) Ltd. has 6 (six) dealers across the State.

5.1.1 **Processing**

The mat ply production is carried out in primary and secondary sections. Splitting and peeling of bamboo is an important operation without which the important commercial bamboo products cannot be made. In order to further it into the secondary section, the bamboo goes through the primary section of the industry where they are cut, split and peeled. The bamboos are cut into proper lengths, the knots

removed and then the bamboo are smoothened and made into uniform sizes so as to weave them. The weaving of bamboo mats are usually done in the Industry itself or are purchased from mat fields. The Industry has around 8 machines in the primary section.

After the mats are being weaved, they are being forwarded into the secondary section in which they are firstly treated with chemicals. This is essential because bamboo is prone to fungal and insect attacks unless treated appropriately. The treatment of bamboo by chemicals not only prevents the boards from insect attack but also gives it a shiny, attractive shade. After the mats are dipped in chemicals such as phenol, caustic soda, etc., they are dried naturally or are passed through the hot chamber. The dried mats are then assembled into appropriate lengths and piled to desired thickness. These assembled mats are then passed through the machine which binds the mats together to produce the mat board which are now ready to be put up for sale. In addition, the produced bamboo ply and mats undergo one more inspection from the workers whether they are fit for the market. Surface finishing like that of sanding, slitting and grain filling are done by them which make the products more attractive. This technical know-how of preparing and processing bamboo is obtained from domestic research institution.

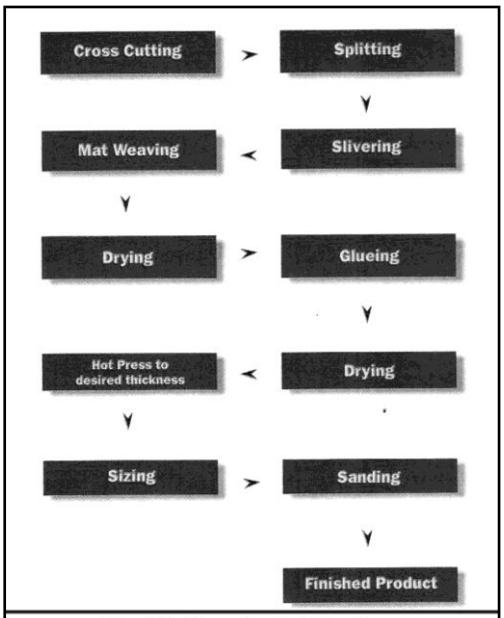

Fig. 5.1 Flowchart of Bamboo Mat Board production (pic: BDA)

5.1.2 **Employment**

It is evident from the various stages mentioned in the previous topic that the Industry needs much manpower to produce even one mat board. Since the Industry produces many boards in a day, it needs a high quantity of labour employees to get the work done. Hence, the industry employs many workers on a regular and contract basis. There is a distinction in the mode of employment because of a couple of factors of which the weather/season factor plays a major role. Production is lower during monsoon season compared to the other seasons of the year. This is because during the monsoon, drying of the chemically-dipped weaves is tough. And if the mats are not dried properly, the product is liable to be attacked by fungi and the like thus bringing down the quality of the mat boards. This is why the employment level at the beginning of the year tends to differ from that of the end.

The number of skilled and unskilled workers employed during the first quarter of the year was 180. But at the actual time of the study, the number dropped to 43 since the study was done just after the coming of the rains. But a point to be noted is that the number of workers does not solely depend on this. In many cases, irrespective of what season it is, the industry undergoes production if it receives orders from the domestic and/or external market. The hot chamber plays a very important part at such times.

5.1.3 **Nature of Operation**

Zonun Mat Ply (P) Ltd. produces mat ply and boards in a perennial manner i.e., throughout the year. Although number or value of production may differ from season to season, or may even be

different between different months, production is non-stop and carried out all year round.

4560 kWh units of electricity are consumed on an average in a month. It may be of wonder how the Industry consumes only such a unit of electricity. This is because in addition to the irregularity of power supply, the costs are high in Mizoram. Therefore, the Industry is compelled to look for lesser priced and reliable alternatives. These alternatives come in the form of coal and oil. They have been used extensively to cut down the volume of electricity consumption and for the continuation of the work in progress.

The industry has been able to reimburse almost all the loans attained from various sources like the govt. agencies, banks and financial agencies. The current outstanding loans from commercial banks amount to ₹ 31 lakhs (approximately).

5.1.4 **Products & Sale**

As already mentioned, Zonun Mat Ply (P) Ltd. manufactures various kinds of boards which are of distinguished qualities. The most prominent ones are Bamboo Mat Board (U.F. & P.F), Fluted Dap Board, Bamboo Particle Board, Sittalpaty Board, Bamboo Composite Board and Bamboo Fibre Board.

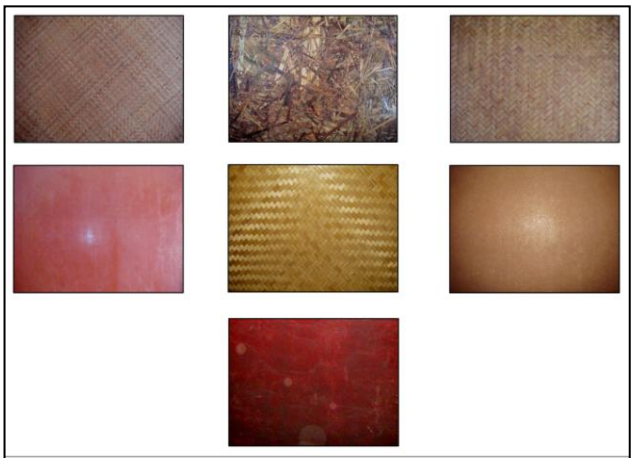

Fig. 5.2 Different Products of Zonun Mat Ply (P) Ltd. (pic: Enga)

The following table shows their costs of production (in approximation) and current market price.

Table 5.1: List of Products & their Cost of Production and Market Prices

Sl.No	Product	Cost of Production (in ₹ approx.)	Market Price (in ₹)
1	Bamboo Mat Board U.F.	450	500
2	Bamboo Mat Board P.F.	500	550
3	Fluted Dap Board	700	750
4	Bamboo Particle Board	600	650
5	Sittalpaty Board	800	850
6	Bamboo Composite Board	1100	1200
7	Bamboo Fibre Board	700	750

Source: Field Survey

N.B. All products stated here are of the 6'X4' sized, 3mm thick boards.

The cheapest cost of production among the products is that of the Bamboo Mat Board U.F (₹ 450/- approx.) and the highest cost of production is attained by the Bamboo Composite Board (₹ 1100/- approx.). These two boards undoubtedly become the cheapest and most expensive products of the industry in the market with the Bamboo Mat Board U.F costing about ₹ 500/- and the Bamboo Composite Board about ₹ 1200/- in the current market.

The gross output of the Industry from 2007 till date is given as under:-

Table 5.2 Gross Output from 2007 (in ₹ approx.)

Sl. No.	Year	Gross Output (Value in ₹)
1	2007-2008	5,30,16,250/-
2	2008-2009	3,84,28,500/-
3	2009-2010	1,73,36,900/-
4	2010-2011 (till date)	38,84,000/-

Source: Field Survey

The Industry sells its products mainly to private consumers. Besides, the products have also been exported to other parts of the

country as well. Therefore, it is apparent that bamboo processing industry can become a source of income for the state not only of revenues from the domestic market but also of the external – national and international markets.

The consolidated statement of some of the products for the month of September, 2011 (Local sales) is given as below:

Table 5.3: Consolidated Statement for the Month of September, 2011

(Local Sales)

Sl. No.	Product	No. of product sold	Amount (in ₹)
1	Bamboo Mat Board (U.F)	120	₹ 60,000/-
2	Bamboo Mat Board (P.F)	37	₹ 20,350/-
3	Fibre Board	17	₹ 12,750/-
4	Bamboo Particle Board	11	₹ 7,150/-
	Total	**185**	**₹ 100,250/-**

Source: Field Survey

As of September 2011, Bamboo Mat Board (U.F) brings in the most revenue with 120 nos. sold which amounts to ₹ 60,000/-. The Bamboo Mat Board (U.F.) is followed by the Bamboo Mat Board (P.F) bringing in about ₹ 20,350/- revenue for the same month. It is important to note that there are other products other than the ones mentioned in the table which are sold in the local market as well.

5.1.5 **Problems**

The Zonun Mat Ply (P) Ltd., right from its inception to present day, is met with many obstacles of which many have been conquered. Among the major problems faced, the biggest ones are of marketing, acquisition of raw materials and infrastructural bottlenecks like transport problems and inadequate supply of cheap power sources. They are discussed at length below:

i) **Marketing**: Marketing is one of the most important activities as it generates revenue. It is the ultimate destination of all industrial concerns – whether small or big – where the goods produced are being bought and sold. Marketing is a broad process of liking the gap between the producer and consumer.[57] The vital role of marketing in accelerating industrial development lies in selling the goods and services produced by these units. In most cases, marketing is a weaker area of small organisations.

Although bamboos have been used extensively in Mizoram, the utilisation has been highly localised as bamboo is viewed as an inferior substitute of timber. For example, although over 1 billion people in the world live in bamboo houses, yet there has been little effort to build such houses (using pre-fabricated structures or otherwise) commercially. Traditionally, bamboo has been harvested in the natural forest and its use has been limited to temporal constructions and low-quality utensils prone to rapid decay. Consumption or utilisation has therefore been direct and restricted to poorer people with low income and low purchasing power. Weak market linkage has adverse consequence in selling the products or it may also be due to non-existence of buyers in Mizoram. Thus, there is low demand in the market which only leads to the Industry not being able to achieve its potential in the production frontier. This is also the case in many other countries of the world.

ii) **Acquisition of raw materials**: Another major problem of the bamboo processing industry is the procurement of raw materials. With the area coverage and the abundance of bamboo in Mizoram, it may be little doubtful from the viewpoint of a layman but the Industry

[57] Ahmed, S.F. (1989) *Problems and Prospects of Cottage Industry in India*, Anmol Publications, New Delhi.

indeed faces hindrance in the attainment of weaved bamboo mats. There is scarcity of desired value-added weaved mats from mat fields. Even if the added costs can be factored in, the irregular and delayed supplies holds up production and sometimes indefinitely. Moreover, if the required mats are not available, they have to compromise on the quality or pay a high price to get good quality materials. Their bargaining power is relatively low due to the small quantity of purchases made by them since their scale of production is but of a small type. This also means waste of productivity of the economy and loss of further units.

As a whole, the biggest impediment towards a bamboo based sector from developing has been the irregular and scant supply of bamboo for entrepreneurial use. The paper and pulp industry in India, which has been traditionally using bamboo for over half a century, has constantly innovated to reduce the use of bamboo in its manufacturing process due to this uneven and scant supply. And after the consumption of the paper mills (who usually have long term contracts with the forest departments), very little is left for any other application. This pattern is true for all Indian states. The present regulatory regime in India is the unambiguous culprit for this irregular and inadequate supply.

iii) **Infrastructural Problems**: Infrastructure problems also add coal to the fire. Unless and until you have the infrastructure in its place, the rest of the efforts are futile.[58] Adequate infrastructural facilities are necessary for the smooth and continuous growth of the industry in particular and of economic growth in general. Industrial production requires not only machinery and equipment but also skilled

[58] http://wiki.answers.com/Q/Difficulties_faced_by_small_scale_industries_in_India

manpower, management, energy, banking and insurance facilities, marketing facilities, transport services which include railways, roads and waterways, communication facilities, etc. All these facilities and services, which facilitate industrial and agricultural production and accelerate the overall economic development of a country, constitute collectively the infrastructure or economic and social overheads of the economy. It is an unfortunate fact that Mizoram is suffering from insufficient social overheads like power, roads and communication facilities. This inadequacy holds back the hilly state from reaping the benefits of whatever it has in terms of forests, minerals and other natural resources.

Transport Problem: It has been observed that Mizoram suffers from inadequate transport and communication facilities. This is the major obstacle to the development of the economy in general and the industrial sector in particular. Its topography and inadequate transport system have resulted in crippling disincentives of excessive transportation cost, undue delay in movement of materials and problems of marketing. Therefore, transportation of finished goods of the industry is laborious, time consuming and costly.

Inadequate Power Supply: Power and electricity is the basic infrastructure around which all economic activities move. The degree of economic growth is highly related with the generation and consumption of electric power. Power shortage, power shutdown and power cuts could paralyse industrial activity, throw thousands of workers out of job and cause inconvenience to consumers.[59] Although Mizoram possesses a vast hydel potential, the progress in this sector is very slow. Achievements made so far in terms of installation and

[59] Aziz, A & Babu, M.D. (1997) *Industrialisation : Socio-Economic Externalities and State Policy*, Concept Publishing House, New Delhi.

generation of power could not keep pace with the growing demand of power. Subsequently, the power situation in the state continues to remain unsatisfactory.

As such is the case, Zonun Mat Ply (P) Ltd. is also not left-out of this inadequacy of cheap power supply. Their average unit of electric consumption is 4560 units in a month. This approximately amounts to ₹ 15,760/- per month. It may be questioned that this unit of consumed electricity is relatively low screening the amount of product produced. This is solely because since the usage of a unit of electric supply is very high, the industry is compelled to find other sources of power supply. Alternatively, coal and petroleum oil is used in the production process. A generator of 100 kVA (kilo volt ampere) has been recently installed to combat power shortages and the like. Although, this generator consumes oil to a great level and leads to a rise in cost of production, it is essential for continuation of the work in progress.

5.2 THE HOUSEHOLDS

The Zonun Mat Ply (P) Ltd. set up quarters in the industrial site (at Lengpui). for its workers as they are from different parts of the state and some also from other states of India. Currently, the 27 quarters built are occupied by the exact number of families. Moreover, since most of them are Christians but are from different Church denominations, the Industry set up a

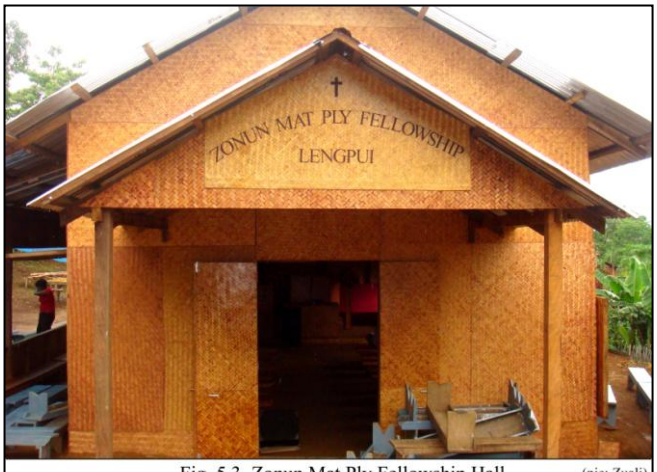

Fig. 5.3 Zonun Mat Ply Fellowship Hall (pic: Zuali)

Fellowship Hall for worship. Construction of this hall was completed within 5 days and it sits about 60 people. The exterior and interior furniture, walls, ceiling, etc all are made from their mat ply products.

The study was made so as to identify the households' status in terms of their sources of livelihood, financial position and that of their possessed assets and the status and economic stature of the workers. Questionnaires were forwarded among the 27 households of the industry of which the latter part of the household schedule were answered by the currently employed. The statistics are given as under:-

5.2.1 **Identification**

The households who are residing in the quarters built by the industry were questioned on different topics such as their number of family members, number of students, salaried workers, daily labourers, and on the profile of the breadwinner of their respective family. It is tabulated as under:

Table 5.4: Identification of the households

Sl. No. of House -holds	No. of family mem-bers	No. of stu-dents	Sala-ried wor-kers	Daily labour-ers	Unem-ployed family mem-bers	Sex of the bread-winner	Age of the bread-winner (code)	Qualific -ation (code)
1	3	0	1	0	2	M	2	6
2	5	1	1	0	3	M	2	1
3	4	0	2	1	1	M	2	1
4	2	0	1	1	0	M	2	1
5	4	1	1	0	2	F	2	1
6	5	0	2	1	2	M	2	1
7	4	2	1	0	1	M	2	1
8	7	2	2	1	2	M	2	4
9	5	3	1	1	0	M	2	6
10	1	0	1	0	0	F	2	1
11	4	2	0	1	1	M	2	1
12	2	1	1	0	0	M	2	4

13	4	1	1	2	0	M	2	1
14	3	1	0	1	1	F	2	1
15	2	0	0	1	1	M	2	1
16	2	0	0	1	1	M	2	1
17	3	0	1	0	2	M	2	1
18	1	0	1	0	0	M	2	1
19	3	0	1	0	2	M	2	6
20	5	1	1	1	2	M	2	1
21	1	0	1	0	0	M	2	1
22	4	0	1	1	2	M	2	1
23	6	2	2	0	2	M	2	1
24	4	0	3	0	1	M	2	1
25	6	2	1	1	2	M	2	1
26	4	0	1	0	3	M	2	1
27	3	0	1	0	2	M	2	4
Total	**97**	**19**	**29**	**14**	**35**			

Source: Field Survey

Code: Sex of breadwinner: M = Male; F= Female.
Age of breadwinner: 1=below 20; 2 = between 20 and 60; 3= above 60
Qualification: 1=below matriculate; 2=matriculate; 3=higher secondary; 4=graduate; 5=post-grad. 6=illiterate.

As already mentioned, there are a total of 27 households residing in the factory site. At the time of the survey, the sum of all the residents amounts to 97. The total number of children who go to schools is 19 which is spread over 12 households. Regularly employed workers amount to 29 individuals while 14 workers questioned are engaged and earn wages on a daily basis. Among the family members of the employees residing in the industrial site, the total number of individuals who are unemployed amounts to 35.

There were 24 households among the total 27 where the breadwinner is a male and there are 3 families where the household income is attained by females. 21 of the breadwinners are below matriculate, 3 are graduates and another 3 are illiterates. All of the breadwinners in each family were of the age between 20 and 60.

5.2.2 **Sources of Household Income** & **Housing Characteristics**

The 27 respondents were also asked about their sources of household income and their housing characteristics. The survey discovered the following:-

Table 5.5: Sources of Household Income & Housing Characteristics

Sl.No.	**Observation**		**No. of Respondents**	**Percentage** (approx.)
1	Sources of Household Income			
	a)	Salary (Pvt. Enterprise)	20	74
	b)	Daily Labourer	5	19
	c)	Both a) & b)	2	7
		Total	**27**	**100**
2	Number of Rooms			
	a)	1 room	13	48
	b)	2 rooms	10	37
	c)	3 rooms	3	11
	d)	4 rooms	0	0
	e)	5 rooms	1	4
		Total	**27**	**100**
3	Possess Land at other Places			
	a)	Yes	5	18
	b)	No	22	82
		Total	**27**	**100**

Source: Field Survey

On enquiring about their source of livelihood, most of the households (74%) earn their income solely from the industry in a salaried mode while 19% earn their livelihood through their daily works and not on a monthly basis. The remaining 7% of the households get their income from both the monthly salaried pays and daily labouring. Moreover, all of the workers who were questioned did not have any other employment other than the industry.

As noted, the quarters in which the households inhabit is built by the factory. Therefore, they do not own it because the quarters are the property of the Industry but they do not pay rents whatsoever i.e.,

they are exempted from paying rents since they are but the workers of the Industry. Most of the houses in which they live are made from the boards and mats that the Industry produced. The most common type of house in terms of number of rooms is that of a one-roomed house, in which 48% of the households are dwelling. 37% of the families have two rooms in their homes while 11% live in a three-roomed house. The remaining (4%) of the quarters have five rooms.

Moreover, most of the families (82%) do not possess lands or farms while a minimal 18% possesses lands and/or homesteads in or outside of the state. All of the households do not have members of their respective families who are working under the government. This follows that most of the families do not have any other reliable source of employment except the employment provided by the Industry.

5.2.3 **Financial Position**

Like that of other communities, the financial position of the households of the Industry varies from one to another.

Table 5.6: Average Monthly Income of the Households

Sl. No.	Average monthly income	No. of households
1	Below ₹ 3,000/-	9
2	Between ₹ 3,000/- to 5,000/-	13
3	Between ₹ 5,000/- to 10,000/-	3
4	Above ₹ 10,000/-	2
	Total	**27**

Source: Field survey

9 (nine) households earn average monthly income below ₹ 3,000/- each while 13 (thirteen) of the households between ₹ 3,000/- to ₹ 5,000/-. 3 (three) households stand between ₹ 5,000/- to ₹ 10,000/- and 2 (two) earn a monthly income above ₹ 10,000/-.

The respondents were also asked whether they possess any outstanding loans, bank accounts and life insurance policy. The following table shows the findings.

Table 5.7: Financial Position of the Households

Sl. No	No. of households possessing --	No. of households	Percentage (approx.) w.r.t. 27 households
1	Outstanding Loans	3	11
2	Savings/Bank Deposits	8	32
3	Life Insurance Policy	2	7

Source: Field Survey

On asking whether they attained any financial assistance from in the form of loans and the like, 89% do not and only 11% applied and get loan from commercial banks.

Most of the workers of the Industry do not hold bank accounts and the habit of saving are not very much inculcated among them. Only 32% of the workers have the habit of saving a part of their income through maintaining a savings bank account (78%) or in a private manner (22%). Moreover, only 7% of the workers possess a life insurance policy.

5.2.4 **Other Assets**

Assets are property owned by a person. They are often regarded as a measure of development since the demand for such goods tends to rise more than proportionally as income rises. They are said to have high income elasticity of demand: as people become wealthier, they will buy more and more of the good.

The luxury goods owned by the households and the number of households which possess them are given as follows:-

Table 5.8: Assets Owned by the Households

Sl. No.	Assets	No. of Households
1	Television	16
2	Refrigerator	7
3	Computer	4
4	Two-wheeler	11
5	CD Player	2
6	Satellite Disc	1
7	Four-wheeler	2

Source: Field Survey

It is to be noted that a certain household can own multiple assets. From Table 5.7, it can be seen that the most common of the assets is the television which is found in 16 houses. Of all the assets, the maxi cab is the only one that is being used for commercial purpose.

Moreover, the households that do not own any goods other than necessity goods amount to 7 (seven).

5.3 THE WORKERS

As already stated, the latter part of the questionnaire was forwarded to the current employees. They were questioned on many topics such as their hours of work, whether they attained training for their current work, and on their views about the bamboo processing industry.

Table 5.9: Number of Employees

	Male	Female	Children	**Total**
Mizo	35	5	-	**40**
Non-Mizo	3	-	-	**3**
Total	**38**	**5**	**-**	**43**

Source: Field Survey

Although the gender composition of other small scale industries of Mizoram and that of India has been viewed as in the favour of the female population, this is not the case in Zonun Mat Ply industry. At the time of the study, there were 43 workers in total of which 5 (11.63%) are females while 38 (88.37%) are males. Out of the 38 males, 35 were Mizos while 3 were non-Mizos.

All of the workers were skilled workers and capable. Categorisation of these workers with respect to their educational qualification is as follows:-

Table 5.10: Category of Employees

Sl.No.	Category	No. of Respondents
1	Below Matriculate	10
2	Matriculate	15
3	Class-XII	13
4	Graduate	5
5	Post-Graduate	0
	Total	**43**

Source: Field Survey

As on October 2011, 35% of the workers were matriculates, 30% passed higher secondary levels, and 12% were graduates and 23% of the workers did not finish their high school. Like in other places of work, it was founded that the workers with the higher educational qualifications managed the higher posts in the hierarchy.

On questioning the currently employed workers about duration and mode of their employment in the Industry, etc., the answers were varied but can be summed up in the following table:-

Table 5.11: Employment Pattern of the Respondents

Duration	No. of respondents
Less than 1 yr.	4
Less than 5 yrs.	14
Less than 10 yrs.	21
Less than 20 yrs.	4
Total	**43**

Mode of employment	No. of respondents
Regular	29
Contract	14
Total	**43**

Source: Field Survey

It was observed that the highest number of respondents, 21 in total, had worked in the Industry for 5-10 years followed by 14 who had worked there for 1-5 years. Moreover, the regular employees outweigh those engaged in a contract basis.

The respondents were also questioned on their hours of work, whether they attained any training for their current work, and if they maintained Employee's Provident Fund. All these are tabulated under:

Table 5.12: Working Conditions of the Respondents

Sl.No.	Query		No. of Respondents	Percentage (approx.)
1	No. of working days/week			
	a)	6 days/week	41	96
	b)	3 days/week	2	4
		Total	**43**	**100**
2	Place of Work			
	a)	Office	5	11
	b)	In manufacturing	30	71
	c)	Other	8	18
		Total	**43**	**100**
3	Obtain Training			
	a)	Yes	17	39
	b)	No	26	61
		Total	**43**	**100**

	If a), training financed by -			
	a)	Industry	9	54
	b)	Own	8	46
		Total	**17**	**100**
4	Employee's Provident Fund			
	a)	Yes	28	64
	b)	No	15	36
		Total	**43**	**100**

Source: Field Survey

A typical working day consists of eight hours of work. Most of the respondents (96%) work six days a week and the remaining (4%) work three days a week. The respondents who work three days in a week are those that are working in the office. Moreover, 11% of the respondents work in the office, 71% in production, and the remaining 18% in other works like mechanical works and the like.

61% of the respondents do not undergo training for their current work and 39% of them do. Among the 39% who went for training, most of their courses were financed by the industry while a smaller portion of the respondents undergo it with their own financing. Employee's Provident Fund (EPF) was set up by the Industry for the respondents. 66% of the respondents maintain the EPF while the remaining does not.

In addition to all these, the respondents were also asked of their opinion about certain matters like whether they think working in the Industry leads to development of their family, if setting up of more bamboo processing industries is desirable and the like. These are summarised in the following table:

Table 5.13: Opinion of the Respondents

Sl. No.	Query		No. of Respondents	Percentage (approx.)
1	Development in family			
	a)	Yes	37	86
	b)	No	2	5
	c)	I don't know	4	9
	Total		**43**	**100**
2	Leads to depletion of bamboo/forest resource			
	a)	Yes	9	21
	b)	No	23	54
	c)	I don't know	11	25
	Total		**43**	**100**
3	Viable source of employment for future generations			
	a)	Yes	34	79
	b)	No	7	17
	c)	I don't know	2	4
	Total		**43**	**100**
4	Biggest problem faced by the Industry			
	a)	Marketing	12	27
	b)	Raw Materials	6	13
	c)	Power & Electricity	4	9
	d)	Infrastructure	3	8
	e)	I don't know	18	43
	Total		**43**	**100**
5	Willing to set up bamboo processing industry			
	a)	Yes	40	93
	b)	No	0	0
	c)	I don't know	3	7
	Total		**43**	**100**
	If (a), source of finance			
	a)	Own	14	35
	b)	Bank Loan	6	16
	c)	Govt. Agency	7	17
	d)	Both (a) and (b)	3	7
	e)	I don't know	10	25
	Total		**40**	**100**

Source: Field Survey

From the Table 5.13, we can see that almost all were in the agreement that working in the Industry has led to a development in their respective family and in the society as a whole. But because of the fact that development measures are not alike in different outlook, 9% of the respondents responded neither in a positive or negative manner i.e., they do not know whether they are or not.

On asking about the harmful effects that such an industry like that of Zonun Mat Ply can cause to the environment, 54% of the respondents replied that they do not think that the bamboo processing industry leads to undesirable effects in the environment while 21% think that it does. The remaining 25% could not say whether it does or does not. Moreover, the questionnaire also asked whether they think bamboo processing industry like that Zonun Mat Ply industry is a viable source of income and stability for the coming generations. Here, too, 79% of the respondents are confident that it is and 17% do not think so. 4% could not say if it would be a reliable source of income for the present and next generations.

The respondents were also asked what they think is the biggest problem faced by the Industry. The common answers were that of market imperfections and the acquisition of raw materials. More than a quarter of the respondents agree upon the market factor as the greatest problem faced by the industry. This followed by the attainment of raw materials with 14% of the respondents in unity. Other factors are of inadequate power and electricity, infrastructural bottlenecks, etc. 43% did not air their views.

93% of the respondents are willing to set up a bamboo processing industry like that of Zonun Mat Ply industry with financial assistance from Banks (30%), Government Agencies (17%) or either or both (4%). Moreover, 35% of the respondents are keen on setting

up an industry from their own means even. 24% of the willing party have no idea as of now from where to get the funds needed.

5.4 THE BUYERS

Questionnaires were also forwarded to 50 (fifty) local consumers of the goods produced by Zonun Mat Ply industry. These respondents are those residing in Aizawl, the capital city. They use it for varied purposes in which most of them use it for construction purposes. Since the products are attractive, they are also used for furniture and the like. The queries are being summarised in the following table:

Table 5.14: Opinion of the Consumers

Sl.No.	Query		No. of Respondents	Percentage (approx.)
1	Prefer bamboo ply to plywood			
	a)	Yes	39	78
	b)	No	-	-
	c)	Can't say	11	22
		Total	**50**	**100**
2	Setting up more industries is desirable			
	a)	Yes	50	100
	b)	No	-	-
	c)	Can't say	-	-
		Total	**50**	**100**
3	Bamboo products are promising in Mizoram			
	a)	Yes	34	68
	b)	No	16	32
	c)	Can't say	-	-
		Total	**50**	**100**
4	Undesirable effects to the environment			
	a)	Yes	10	20
	b)	No	26	52
	c)	Can't say	14	28
		Total	**50**	**100**

5	Depletion of bamboo/forest resource			
	a)	Yes	11	22
	b)	No	25	50
	c)	Can't say	14	28
		Total	**50**	**100**
6	Viable employment generation			
	a)	Yes	50	100
	b)	No	-	-
	c)	Can't say	-	-
		Total	**50**	**100**
7	Biggest problem faced by industries in Mizoram			
	a)	Financial	10	20
	b)	Raw Materials	4	8
	c)	Marketing	10	20
	d)	Power & Electricity	17	34
	e)	Management	2	4
	f)	Infrastructure	7	14
	g)	Can't say	-	-
		Total	**50**	**100**
8	Willing to set up bamboo processing industry			
	a)	Yes	28	56
	b)	No	8	16
	c)	Can't say	14	28
		Total	**50**	**100**
	If (a), source of finance			
	a)	Own	3	11
	b)	Bank Loan	13	46
	c)	Govt. Agency	6	21
	d)	Private moneylenders	1	4
	e)	Others	-	-
	f)	Can't say	5	18
		Total	**25**	**100**

Source: Field Survey

In the initial part of Table 5.14, it can be seen that 39 of the 50 respondents (78%) on using the bamboo ply produced by the Industry prefer it to that of plywood in the market. However, because of factors mainly of price, 11 (22%) are indecisive. Moreover, all the

respondents agree that setting up of more bamboo processing industries like that of Zonun Mat Ply (P) Ltd. is desirable.

In view of the potentiality of bamboo products in Mizoram market, 34 (68%) of the respondents think that bamboo ply and boards are promising goods while 16 (32%) of them do not think so. They stated that this is mainly because of market imperfections prevailing in the economy.

52% of the respondents are of the view that processing of bamboos are eco-friendly and do not think that it has undesirable effects in the environment. On the other hand, 20% of the respondents think that it does to a certain extent. The remaining 28% did not air their opinions. Moreover, 50% of the respondents are aware that Mizoram is abundant with bamboo and thus, producing ply and boards in the industrial level do not lead to immense depletion of the resource. Nonetheless, 22% are of the opinion that constant felling would undoubtedly lead to bamboo/forest reduction while 28% answered in neither the positive nor negative manner.

All of the respondents think that setting up of more bamboo processing industries will lead to more employment and a subsequent income generation.

The buyers were also asked what they think is the biggest problem faced by the industries of Mizoram in general. The answers were varied. 34% stated that power and electricity, 20% each answered the financial and marketing factor, 14% stated the infrastructure. Moreover, 8% of the respondents said that acquisition of raw materials is the biggest problem faced by industries in Mizoram and another 4% replied that management is the biggest hindrance to successful running of an industry.

On asking whether they would be willing to set up a bamboo processing industry like that of Zonun Mat Ply industry, 28 of the 50 respondents (56%) responded that, given that all factors are on hand, they would be willing to set up such an industry. Furthermore, the willing party were questioned as to where from they would get the fund needed for setting up an industry. 46% of them would ask for loans at the commercial banks, 21% from government agencies in the state and 4% from private moneylenders. 11% of 28 willing respondents are willing to set up bamboo processing industries with their own capital and the remaining 18% have no idea as of now from where to get the funds needed. Conversely, 8 individuals of the 50 respondents (16%) replied that they are not interested in setting up bamboo processing industries. Most of them are not interested in setting up any industry not only that of the bamboo based ones. The remaining 14 (28%) could not give a solid answer.

C H A P T E R - 6

FINDINGS, RECOMMENDATIONS AND CONCLUSION

Initially called ‘poor man’s timber,’ bamboo today has been dubbed the ‘Green Gold’ of the 21st Century. It has played a significant role in human society since time immemorial and now contributes to the subsistence needs of over a billion people worldwide. It has been traditionally used as fuel, food, for rural housing and shelter, fencing, tools and various other purposes. In modern days, it is being used as industrial raw material for pulp and paper, construction and engineering materials, panel products, etc. Bamboo, which can be grown easily, is much faster in growth than any known tree. It is eco-friendly and adaptable to various locality factors, is now becoming the most promising wood substitute. It has more than 1,500 documented applications, ranging from medicine to nutrition, from toys to aircraft.

6.1 FINDINGS

The analysis and interpretation of data pertaining to the bamboo processing industry obtained from field survey and secondary sources has given some significant results. The major findings of the study have been accentuated below:

- The main raw-material, bamboo, is a renewable resource. It is considered to be the fastest growing plant that grows three times faster than the fastest growing tree. They are capable of growing 100 cm (39 in.) or more per day due to its unique rhizome-dependent system. Twice in a year, bamboo propagates its shoot and in a matter of 3 months, the bamboo shoot can grow up to the height of the parent bamboo. Evidently it needs more carbon-dioxide to grow at such a fast pace. It absorbs carbon dioxide and releases oxygen into the atmosphere, at a rate of 3

to 4 times higher than many other trees. Moreover, it is often said that bamboo effectively cleans the water pollution of the septic tank discharge and factory effluent by its natural affinity for nitrogen, phosphorus and heavy metals.

- It was founded that although Mizoram is abundant with bamboo resource, most of the species are not practicable for industrial use. The locally called 'mau' is deemed to be inferior to that of 'rua.' Moreover, the naturally growing bamboos in Mizoram are good, but not excellent for industrial use. For example, there were about 25 million MT of Muli bamboo (*Melocanna baccifera*) before the 'mautam.' But this species of bamboo is not viable for commercial production because the diameter of the culms is too small. So, one must be able to identify the commercially-viable species of bamboo for producing the products at a large-scale. This identification is two-fold because different species undergo different patterns of growth in different elevations. In low elevations below 1000 metres, plantation of *Dendrocalamus longispathus* (Rawnal) and *Bambusa nutans* (Ankhuang) may be suggested. *Rawnal* is naturally available in Mizoram but is not excellent in high elevations because it becomes very small. On the other hand, *Dendrocalamus hamiltonii* (Phulrua) can grow big in high elevations but are not suitable for industrial use because they are not straight enough and their buds are too big. Moreover, *Dendrocalamus sikkimensis* (Rawmi) is also good but it may be stated that *Dendrocalamus latiflorus* may be stated to be among, if not, the best, for use in commercial purposes that can grow in high elevations up to 6000 feet. Its diameter can

measure up to 18-19 inches. However, how low can this species be grown is still not known. So, in order to efficiently run an industry based on this resource, one has to identify which species of bamboo to plant and grow and which type boost the industry to its potential.

- It is one of the main finding that setting up and running a bamboo processing industry is in accord with the mentality of the Mizos. Not only are they skilful enough to undergo such a venture, bamboo processing industries can bring in large and fast returns. For instance, the amount of finance used up for attaining the machineries can be well paid up by the first five years if demand and its subsequent production are not clogged. This is not the case in other enterprises, especially industries.
- The Zonun Mat Ply (P) Ltd. certainly generates employment opportunities to the manpower in the State. During its peak season, the number of employee shoots up to more than 200 and even in the off-periods, it employs as high as 43. Thus, it would also be clear from even a layman's view that production of more processing industries will lead to more employment opportunities as it is a labour intensive industry.
- Production in the Industry is carried out in an eco-friendly manner. Right from the primary section to the finished goods, it is safe to say that it does not emit any impurities in the air, soil or water. Although chemicals are used for the treatment of weaved mats, disposal is carried out in such a way that the residue is disposed-off properly. A tank is built underneath the ground for the chemical residue and is further treated with other chemicals to neutralise it. It is a pride to state that even the

bamboo dust does not go to waste because it is being used for producing particle boards and the like. Therefore, the processing of bamboo into boards and ply do not cause harmful effects to the environment but rather helps in ecological balance its demand for the main raw-material bamboo.

- The bamboo processing industry (Zonun Mat Ply (P) Ltd.) has been able to attain considerable amounts of revenue over the years. Though most of the general masses are still ignorant about the products, it is beginning to find its niche in the market. This is evident from the revenue that the Industry has achieved.

- Output changes with change in demand. This is apparent from the gross output of the Industry. The output level was high in 2006 because the Industry supplied its ply and boards to the Andaman and Nicobar group of islands. It decreased by a small level in the years that follow. This is because the level of demand has fallen. But it is not to say that the level of output and of revenue is insufficient. It is able to meet the requirements of the Industry and the workers. However, a higher level of demand is more desirable to substantially exploit the abundant natural resource of the State.

- The 27 families residing in the quarters of the Industry are not employed in any other activity i.e., they do not have any other source of income. This shows that the income they acquire from the Industry is sufficient, not only for the basic necessities of life but for the purchase of luxury items. 16 households own a television set, 11 possesses two-wheeler vehicle, 7 households possess a refrigerator, and 4 own a computer in their quarter.

Moreover, those who have family members of school-going age are able to provide education to their children as well.

- One of the biggest problems faced by the Industry is the acquisition of raw materials. Although bamboo is abundant in the State, the value-added weaved mats are scarce. This is mainly because labour cost in Mizoram is high. While labour in other parts of the country could weave the bamboo mats at a low wages, the Mizos are not willing to work at such wages. Thus, the Industry faces problems in the acquisition of weaved mats that are to be further processed into ply and boards. In addition to this, the prices of chemicals like phenol, formaldehyde and caustic soda has escalated resulting in high pricing of the finished products. Moreover, infrastructural bottlenecks like high cost of transportation and unavailability of cheap power sources also plays adverse roles in production. The major problems are already emphasised at length in the empirical analysis chapter.

- Compared to plywood, bamboo mat board is still quite unpopular in the domestic market and is still struggling to establish a strong market. This is credited to the ignorance of the consumers. Bamboo is more durable than plywood and so, serves an economic viability for the buyers as well. One of the consumers before buying the product took a test and soaked samples of plywood, bamboo ply and teak ply in a bucket for a week. It was concluded that bamboo ply is the most economical among the three because bamboo ply did not change its facade and lustre while the other two did. Therefore, under similar conditions, a bamboo ply can sustain humidity better than the

others. So, it is more durable and there is a higher guarantee for a longer period of time.

- The number of families who attain their source of income in a salaried mode outweighs those of the daily labourer. Moreover, most of the families do not possess lands in or outside the state. And there are no government servants amongst them. So, it is clear that employment and income is attained solely from the Industry. Moreover, all the employees of the Industry are aged between 20 and 60. Child labour is absent and there are none that are aged above 60. Thus, this follows that the workers are in their most productive stage of life.

- There is a common belief that female work participation rate tends to be higher in tribal areas as compared to plain areas. Analysis of the data collected from primary source reveals that more number of men are employed in the Industry. Females constitute only 12% of the workers at the time of the study.

- On enquiring about the market price of plywood (which is commonly used for the same purpose), the price of bamboo ply produced by the Industry costs more than that of the plywood imported from other states of the country. Plywood of the same thickness and size costs around ₹ 350/- while that of bamboo ply costs ₹ 500/-. So, there is a difference of ₹ 150/- between the two. But looking at it from all the angles of economic measures such as durability, eco-friendliness, sustainability, etc., it is safe to say that the bamboo ply which is priced higher than that of the plywood is preferable. Moreover, the purchases of the domestically produced bamboo ply and boards opaque the outflow of revenue and retain the same inside the economy.

Thus, it is economically more favourable to purchase the domestic product.

- 49% of the households earn a monthly income between ₹ 3,000/- and ₹ 5,000/- while 33% earn below ₹ 3,000/-. 11% of the households stand between ₹ 5,000/- and ₹ 10,000/- while 7% earn a monthly income above ₹ 10,000/-. Thus it is clear that the Industry indeed produce substantial income for the households.
- Borrowing Loans, Savings Account and Life Insurance Policy are not very popular among the households, with respect to the total number of households in the Industry, 11% possess outstanding loans in the commercial banks, 32% maintain a savings bank account and only 7% uphold a life insurance policy.
- Among the 29 regular and 14 contract workers currently employed, 50% have been in the Industry for about 5-10 years. 32% employed for 2-5 years and 9% for 10-20 years. The remaining had only started working in the Industry and been there for less than a year. The fact that the employees are willing to stay engaged in the Industry for long period shows that the Industry does provide a substantial source of income to a number of people in the State.
- A typical working day consists of eight hours and majority of the workers (96%) set out for work six days in a week. Moreover, the workers can also be classified into those working in the manufacturing (71%), in management (11%) and other type of works like mechanical and such (18%). In addition, 39% of the current workers undergo training of which the Industry

provides the finance in most cases. There are also that finance their own training. However, those that did not take up training cannot be discarded as unskilled labours because their crafting and processing skills are up at par with the skilled ones.

- The Industry has taken up various social and financial security which is an important factor in employment. This is evident from the fact that Employee's Provident Fund is being maintained for the workers. 64% of them avail this fund.
- Majority of the workers think that working in the Industry has helped them develop to a great extent. If not unemployed, their previous engagement prior to that of being employed in the Industry mostly consists of agricultural farming.
- 79% of the workers are confident that a bamboo processing industry like that of Zonun Mat Ply industry is a feasible source of income and employment for future generation. More than 90% of the workers, if possible, would be willing to set up a bamboo processing industry like that of Zonun Mat Ply. Acquisition of financial assistance will be had from banks, agencies, and even from their own. In addition, 54% of the respondents think that bamboo processing by the industry do not lead to undesirable effect in the environment.
- Among the workers, market imperfection and the acquisition of raw materials are deemed to be among the biggest problem faced by the Industry. More than 27% replied with the market factor and 13% stated the attainment of raw materials to be one of the biggest hindrances causing slack in production.

- 78% of the consumers prefer bamboo ply to that of plywood. This shows that the products are acclaimed by the public which can further mean that they are of prestige rank. Moreover, 56% of the buyers would be willing to set up a bamboo processing industry given that all the factors of production are at hand. In addition, all are in agreement that it is a viable source of income and employment generation.
- The potential of bamboo products is viewed to be a promising one by 68% of the consumers. 52% are aware of the eco-friendliness of bamboo and its processing. Moreover, half of the respondents do not think that industrial processing of the State's bamboo leads to depletion of the resource since it is a renewable resource, if properly regulated.
- Like that of the workers, more than half of the consumers are willing to set up a bamboo processing industry like that of Zonun Mat Ply industry. Common answers about source of finance were commercial banks and government agencies. Some are even willing to set up an industry with their own finance.

From the numerous Findings above, the H_1 hypothesis is rejected and H_0 hypothesis is accepted. This means that bamboo processing industry certainly has a good potential for promoting economic development of Mizoram. This follows that setting up of more bamboo processing industry in the State will only help in advancement and rise in GSDP. It will also help in promoting ecological balance of the environment.

Mizoram is yet to develop a suitable base for large and medium scale industries. The slow industrial development may be charged to its geographical disadvantages, lack of proper communication, paucity of raw materials, non-availability of adequate skilled labour, absence of large market, non-viability from the viewpoint of cost effectiveness, etc. There exists a scope for bamboo and bamboo processing industries in the state provided that enough power supply, improved road conditions, good communication, subsidies and encouragement from the state government are granted. These and other suggestions are given in the following sub-head.

6.2 RECOMMENDATIONS

In line with the findings of the study, there are some policy prescriptions and measures that can be taken up so that industries, especially bamboo processing, may contribute more to the Gross State Domestic Product and result in an all-round development of the state economy.

- A number of the respondents are aware that constant felling of bamboo will lead to depletion of the forest resource in the future. In order to prevent this and to sustain the renewability of bamboo, felling rules and felling cycles should be strictly formulated and followed. These are two major considerations in the management of bamboo areas. A cycle of 3 or 4 years for felling is prescribed. This is because a shorter cycle results in deterioration of clumps and a longer cycle may result in overcrowding. The felling cycle and felling rules may vary from one state to the other. For Mizoram, it is suggested that bamboos should be worked normally on a 4 year cycle.

- Imagining that in the long run, Mizoram is to set up numerous bamboo processing industry in the State. Firstly, it has to start large-scale cultivation of the right type of bamboos. The headache for a million seedlings arises. Mass reproduction Of course happens when they flower and give out seed. These can be germinated into new ones. But as the flowering of bamboo occur only at large intervals and since the seeds, if not instantly germinated die after a few months, this cannot be relied upon. Therefore, the only answer is tissue culture[60] and a subsequent rooting. Each bamboo species have its own protocol in tissue culture. The right proportion in *Dendrocalamus hamiltonii* may not be applicable for *Bambusa tulda*. A tissue culture laboratory specialising in bamboo needs to be set up or at least identified so that the right type of species can be cultured and rooted. This will also help in countering the quantitative loss of bamboo during its flowering season as well.

- It is one of the main findings that labour cost in Mizoram is very high. This owes its hike to the mentality of the workers. They are unwilling to work at low prices as compared to other parts of the country. So, in order to create their own employment, the workers need to be willing to work at lower wages which will not only enable them to earn income but also prevents the outflow of wages to other states. Moreover, technological investment is necessary to raise the level of production to bring down labour cost as well as the overall manufacturing cost.

[60] Plant tissue culture is a collection of techniques used to maintain or grow plant cells, tissues or organs under sterile conditions on a nutrient culture medium of known composition.

- It is often stated that while bamboo resource is depleting in other parts of the country, Mizoram has abundant natural bamboo resource. However, there is no proper management of the bamboo resources in the state. The government recently framed a bamboo policy for ensuring optimum utilisation of this resource. A bamboo institute may be opened in the State to train young entrepreneurs in producing different products and caring for its varieties.

- Owing to low level of operation and absence of technological benefits of large scale operations, the manufacturing cost is high in Mizoram. To bring down manufacturing cost, large scale production is necessary. There will be a problem of marketing for which entrepreneurs may explore markets outside the state and neighbouring countries. It will also lead to reduction in transportation cost, as the inward trucks, which are at present returning empty can carry return load.

- Availability of power itself is a major problem in Mizoram. Big projects, namely Tuivai HEP, Lungreng HEP, Chhimtuipui HEP and Mat HEP, waiting for clearance at appropriate levels, need to be implemented on top priority basis. Besides, the State may try for more grid power from neighbouring states.

- The total length of all types of roads in Mizoram up to December 2010 is 6349.60 km and road density is 30.12km/100 sq. km. approx. There is need for development of road and transport system not only within the state but also with other states of the region to provide connectivity. Alternatively, there should at least be a different connecting route to transport bamboo from the forest or cultivation areas to the industry. In

more specific terms, there should be a bamboo road which connects the different areas of bamboo cover so that transportation of raw materials is carried out in the best efficient way.

- The general masses are still ignorant about the economic practicability of bamboo mat boards and as result, it is quite unpopular in the domestic market. This can be helped by promoting advertisements in the public media or hosting events and expos that showcase the varied bamboo products.
- More effective management system needs to be explored. For example, instead of the current system of harvesting of bamboo from forests in the mahaldari system, the State can explore systems with greater involvement of local communities like lease to individuals, community enterprise, etc.
- The present export policy in agro industry should also be adopted and encouraged for bamboo sector development in the State. Joint ventures with entrepreneurs outside the State and the country should be encouraged so as to attain technology, finance and export linkages which will channelize the resources through local traders and manufacturing industries into domestic and international markets earning the much-needed revenue for the State.
- Credit facilities provided by State financial institutions play an important role in improving small scale industries. Further simplification of credit procedures will open opportunities for small scale industry entrepreneurs to get loans.

- The government is expected to act as facilitator in development process. Its main responsibility is to create an environment that is conducive to faster growth of business and industry. It should undertake a study in depth to investigate into the reasons of high sickness and slow growth of industries. The legal and administrative framework needs to be upgraded to promote industry.

All in all, it is crucial that the four factors, namely production of raw materials, transport, processing and marketing, go hand in hand. Identification of all these factors needs to be made so that bamboo processing industry of Mizoram can meet its true potential and lead to growth and development.

6.3 CONCLUSION

Bamboo processing is a new and developing industry in Mizoram. It simultaneously confronts challenges and opportunities, difficulties and hopes. The Government should continue to develop and improve bamboo resources and products with a view toward contributing to the health of the State's ecology and to enhancing the development of Mizoram.

In spite of the fact that bamboo is a multipurpose, eco-friendly crop and abundantly available, it still remains an underutilized natural resource. There is need for proper management and exploitation in sustainable levels. Various problems are prevailing which hamper the growth of the bamboo sector. Preventive and corrective measures may be taken by the State Government so as to promote the sector which will help in combating the growing ills of the economy like

unemployment, low standard of living, etc. This resource needs to be fully tapped as an industrial raw material, as substitute for wood in rural/urban housing, engineering works, handicrafts, furniture and value addition through export. Undoubtedly bamboo can revolutionise the economy of the State.

Bamboo is indeed an eco-friendly resource. Even its processing does not lead to adverse environmental effects. It does not involve big machines that give out impurities to the air, land or water like that of other industries. Moreover, the climatic condition of Mizoram is found to be favourable for mass plantation of bamboo which will not only provide the processing industry with the rough and value-added raw materials but also leads to desirable effects in the environment thus paving the way for sustainable development.

Bamboo processing industry undeniably creates employment opportunities for both the educated and uneducated unemployed. The skills needed for production are those that, with practice and training, can be easily mastered even by the illiterates. Therefore, the industry can cater to the growing rate of unemployment. It will help them earn income which could be used for attaining their daily necessities and higher standard of living. The small scale bamboo processing industry has a vital role in expanding employment opportunities and increasing the income of rural communities. The industry can employ a greater number of workers and its raw material grows abundantly in Mizoram. With relatively little capital, rural communities can develop this business and provide their own employment opportunities. This is possible because the success of the Industry cannot be separated from the fact that the employees have a special expertise in combining local materials with modern designs.

The life of bamboo processing industries depends on several factors such as the continuous provision of bamboo raw material, development of product capabilities and further development of the international market. In terms of the provision of bamboo raw material, there is a need to cultivate specific bamboo species to support the ongoing development of bamboo processing industries in Mizoram. There is also a need to provide management of bamboo plantations, a provision that would insure the efficient use of existing bamboo stands through cultivation and harvesting, processing techniques and treatment post-harvest. Moreover, access to related technology is said to be highly relevant particularly in the attempt to improve the quality of product. Therefore, government and non-government institutions need to provide workers with training in the technology for the production process.

In conclusion, one of the biggest point to be noted that makes bamboo processing industry a viable economic venture for Mizoram is that it accords with the skills and the mentality of the Mizos. A faster return is possible with such an industry. For instance, the capital assets acquired from banks and government agencies etc. can be well paid off in the first five years of production because it employs machineries which costs less compared to others. This is not the case in other industries, let alone bamboo-based industries like paper mills and such. Therefore, the maturity of the mentality of the workers and the willingness to work on the part of the entrepreneurs coupled with the wide domestic and foreign market, setting up of more bamboo processing industry can move the State to the path from economic development to that of economic growth.

APPENDICES

A P P E N D I X - 1

QUESTIONNAIRE FOR THE INDUSTRY

1. Identification

Name	
Address	
SSI or Cottage	
Year of Establishment	
Investment in Machinery	₹

2. Type of Organisation

a) Individual Proprietorship		d) Pvt. Ltd.	
b) Partnership		e) Cooperative	
c) Pub. Ltd. Company			

3. Number of Employees

	Male	Female	Children (below 12 yrs.)	**Total**
Mizo				
Non-Mizo				
Total				

4. Category of Workers

Category	Number	Category	Number
Skilled		Below Matriculate	
Unskilled		Matriculate	
Semi-Skilled		Class-XII	
		Graduate	
		Post-Grad.	

5. Source of Power

a) Coal		d) Electricity	
b) Oil		e) Firewood	
c) LPG		f) Not Needed	

Unit of electricity consumed in a month (avg.)	

6. Nature of Operation

a) Perennial		b) Seasonal		c) Casual	

7. Technical Know How obtained from

a) Abroad		d) Special Agency	
b) Domestic research institution		e) Others	
c) Domestic collaborating company		f) None	

8. Outstanding Loan (if any)

Source	
a) Bank or Financial Agency	
b) Govt. Agency	
c) Money Lenders	
d) Relatives/Friends	
Total	

9. Gross Output in ₹

2004-05	2005-06	2006-07	2007-08	2009-2010	2010-2011

10. Buyers of the Products

a) Pvt. Customers		c) Intermediary manu. units	
b) Govt. Dept.		d) Others	

11. List of Products & their Cost of Production and Market Prices

Sl.No.	Product	Cost of Production	Market Price

12. Consolidated Statement for the month of September

Sl.No.	Product	Amount of Sales

13. Major Problem Faced

a) Financial		d) Power	
b) Acquisition of raw materials		e) Management	
c) Marketing		f) Others	

Specify:

Remarks:

A P P E N D I X – 2

HOUSEHOLD SCHEDULE

Block - 0: **Identification**

1	No. of family members		5	Unemployed	
2	No. of Students		6	Sex of the breadwinner	
3	Employed (Permanent)		7	Age	
4	Daily Labourer		8	Qualification	

Sl. No. 6 code 1 = male, 2 = female;
Sl. No. 7 code 1 = below 20, 2 = between 20 and 60, 3 = above 60
Sl. No. 8 code 1 = below matriculate; 2 = matriculate; 3 = Class-XII; 4 = Graduate; 5 = Post-Grad.; 6 = Illiterate

Block – 1: **Sources of household income/livelihood**

1.1 Sources of household income (can be more than one)

1	Salary (Government- Permanent)	
2	Salary (Government – Temporary)	
3	Salary (Private Enterprises – technician, driver, sales manager, etc)	
4	Business/Contract	
5	Daily Labourer	
6	Interest/rental income	
7	Pension	
8	Remittance/Transfers from families/friends	
9	Other (write name)	

1.2	Select the two most substantial ones		

1.3	Engage in work outside of Zonun Mat Ply industry	

(code: 1 = yes 2 = no)

	If yes, state where	

Block – 2: **Family and Housing Characteristics**

1	Do you own the land in which your house is situated?	
2	If No, amount of rent paid monthly (Rs.)	
3	Number of rooms	
4	Possess land other than homestead	

5	Any govt. servants among family member	

(code: 1 = yes 2 = no)

Block – 3**: Financial Position**

1	Monthly family income	
	i) Below ₹ 3,000/-	
	ii) Between ₹ 3,000/- to 5,000/-	
	iii) Between ₹ 5,000/- to 10,000/-	
	iv) Above ₹ 10,000/-	
2	Do you have any outstanding loans? (1 = yes 2 = no)	
	i) Govt. bank	
	ii) Private (money lenders, etc.)	
3	Monthly loan repayment (Amount in Rupees)	
4	Do you have any savings/deposits? (1 = yes 2 = no)	
	i) Saving deposit (amt. in ₹)	
	ii) Fixed deposit (amt. in ₹)	
	iii) Private (amt. in ₹)	
5	Do any of your family members have Life Insurance? (1 = yes 2 = no)	
	If yes, total insured amount	

Block – 5: **Other Assets**

Sl. No.	Asset	Do you own this asset? (1 = yes 2 = no)	Any benefit received from the industry? (1 = yes 2 = no)	Used for commercial purpose? (1 = yes 2 = no)

WORKER'S SCHEDULE

Questions On Zonun Matply:

1	How long have you been employed in the Industry? (Yr/Months)	
2	How are you employed?	
	a) Regular	
	b) Contract	
3	How many hours do you work daily?	
4	How many days do you work in a week?	
5	Nature of work	
	a) Office	
	b) In manufacturing	
	c) Other (state nature)	
6	Did you undergo training? (1 = yes; 2 = no)	
	If yes, who sponsored the training course?	
	a) Industry	
	b) Own	
7	Do you maintain an Employee's Provident Fund? (1 = yes; 2 = no)	
	If yes, amount till date (in ₹)	
8	Do you think you and your family gain substantial benefits/development by working in the Industry? (1 = yes 2 = no)	
9	Do you think bamboo processing industries leads to depletion in the forest resource? (1 = yes 2 = no)	
10	Will setting up of more bamboo processing industries generate more employment? (1 = yes 2 = no)	
11	Biggest problem faced by the Industry	
	a) Marketing	
	b) Capital	
	c) Infrastructure	
	d) Management	
	e) Power	
	f) I don't know	
12	Willing to set up an industry like Zonun Mat Ply? (1 = yes 2 = no)	

	If yes, source of funds needed	
	a) Own capital	
	b) Bank Loan	
	c) Govt. Agency	
	d) Private moneylenders	
	e) Cant say	

Remarks:

A P P E N D I X – 3

BUYER'S SCHEDULE

1. Do you prefer bamboo ply to wood ply?

Yes		No		Can't say	

2. Do you think setting up of more bamboo processing industries in Mizoram is desirable?

Yes		No		Can't say	

3. In view of the market structure of Mizoram, do you think ply and mats produced from bamboo are promising?

Yes		No		Can't say	

4. In your opinion, does processing of bamboo in industries like that of Zonun Mat Ply lead to undesirable effects in the environment?

Yes		No		Can't say	

5. Do you think an industry like Zonun Mat Ply through its processing leads to a depletion of the bamboo and forest resource?

Yes		No		Can't say	

6. Will setting up of more bamboo processing industries generate more employment?

Yes		No		Can't say	

7. What, in your opinion, is the biggest problem faced by industries in Mizoram?

a) Financial		d) Power	
b) Acquisition of raw materials		e) Management	
c) Marketing		f) Others	

8. Will you be willing to undertake this kind of industry?

Yes		No		Can't say	

If yes, where will you get the fund needed?

a) Own		d) Private moneylenders	
b) Bank Loan		e) Others	
c) Govt. Agency		f) I don't know	

Remarks

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