

BAMBOO ENTREPRENEURSHIP - OPPORTUNITIES FOR RURAL EMPLOYMENT

Y.C. TRIPATHI

*Rain Forest Research Institute,
Jorhat (Assam).*

Introduction

Bamboo is an enduring, versatile and highly renewable resource known and utilized for thousands of years. It has played an integral role in social, cultural and economic development, especially in Asia since ages. Millions of people depend on it for their livelihood and for household and functional uses. In return, communities have nurtured and protected bamboo and are repositories of vast knowledge and skills related to the propagation, processing and usage of bamboo. They are among the fastest growing plants on the planet Earth. For most purposes bamboos are harvested from third years onwards, making it a truly renewable resource. The range of traditional uses has varied from housing to music, food to transport, agricultural tools to weapons and basketry to bridges. Local communities have adapted this versatile material to meet their needs in ingenious and innovative ways.

Agencies involved in promotion of Bamboo are of the opinion that with new technical inputs, marketing finesse and a renewed commitment, bamboo could take on the role as the 'material of the future'. This is a realistic expectation, given the physical qualities of bamboo and its long and rich history of use. Bamboo occurs naturally on every major continent except

Europe. India is one of the richest countries in Bamboo population with about 130 species out of the total 1,250 species under 75 genera found in the world. Bamboo covers 8.96 million ha of forest area equivalent to 12.8% of the total forest land of the country (Rai and Chauhan, 1998). In addition, sizeable bamboo plantation is found outside forest generally on homestead, community lands and farmlands.

With the rapid socio-economic transformation and industrialization of the country, Bamboo gained importance as a raw material not only for cottage industry but also for large-scale industries. With attractive physical and strength properties, bamboo has great potential as construction and structural material for meeting the needs effectively and inexpensively. Pulp & paper industry and bamboo craft sector are the two major users of bamboo resources. However, its industrial potential in the manufacture of a host of value added products like laminated boards, bamboo fibre-cement board, flooring, wood substitute, medicine, food products, etc., provide enough opportunity for employment and income generation and at the same time ensures efficient and sustained utilization of available resources.

In the recent past, considerable achievements have been in commercial

exploration of bamboo resources that has opened new vistas for its industrial exploitation. A number of marketable products have been developed out of bamboos that are well appreciated by the consumers all over the world. Bamboo based cottage industries can provide gainful employment to rural population in India.

Scope for Rural Entrepreneurship

Used for millennia for a wide range of day-to-day purposes, both as woody material and as food, bamboo has been the backbone of much of the rural life and will remain so with population increase. Bamboo continues to play an important part in the development of enterprises and transformation of rural environments. Its attributes and potential are increasingly recognised all over the world. Rural communities with their skills evolved over centuries of usage, putting the material to aesthetic yet functional use. People are also repositories of knowledge, which can be extremely useful for the development of the sector having vast potential for generating income and employment, especially in remote areas and amongst communities, which have tended to be economically and socially disadvantaged.

Expanding green markets offer new opportunities for the promotion of bamboo products. For tribal and forest dwellers, 'bamboo for living' and 'living with bamboo' is still the norm, this offers an excellent entry point in increasing employment, income generation and improving the nutritional status of the rural poor. Since bamboo can provide the basis for an expanding small and medium-scale enterprises sector, it offers an effective

mechanism for rural poverty alleviation and livelihood security.

Establishment of Cottage Industries

For economic empowerment of village communities through employment and income generation, different types of cottage and small scale industries can be set up in rural areas based on different form and applications of bamboo.

Primary Processing of Bamboo

In order to empower the people at grass-root level and also to create employment opportunities in bamboo growing regions of India, setting up of clusters of mechanized primary processing units for bamboo merits attention. These units would be engaged in *primary processing of bamboo*. The primary processing of bamboo for production of slivers which could be used in the board unit comprises of the following steps :

(a) *Cross Cutting* : In the first step, the bamboo culm of 10 m or more is cut into shorter lengths (about 1.10 - 1.20 m). The cross cut sections are then split along the length. This can be done either by using a radial or parallel splitter. The knot removal and two-side planing functions can be done by separate or a single machine, which are further processed for the manufacture of bamboo composites at the plant level.

(b) *Splitting of Bamboo Culm* : Bamboo splitters can split a bamboo into four, six, or eight parts leaving straight strips having a thickness equal to the wall thickness of bamboo. The culm is fed manually between the splitting tool and tail stock. The tail stock pushes the bamboo against the tool and the bamboo is split. Tempering of the

blades is necessary to ensure longer edge life.

(c) *Knot Removing* : After splitting, the nodes and other protrusions are seen on the splits. The knot is simply the internal projection of the node. Improper removal of the projections on bamboo splits weakens its strength and increases the number of rejections. The knots can be removed using a circular saw fixed on a table or by a knot-removing machine. Once fed into the machine, the splits are sucked inside and its knots are removed with the help of rotating fine toothed circular saw fixed.

(d) *Two-sides Planing* : After knot removal, the splits are passed through the two-side planer. There is an array of rollers, which act as drivers and guide ways. Once fed into the machine, two sides of bamboo splits are planed with the help of blades positioned at various places along the rollers. The bamboo slivers so obtained are further processed for the manufacturing of bamboo composite sections at the plant level.

Processing units established at the rural cluster level working with seven machines each for various operations can generate direct employment for about 10 persons. The clustering of units carries several inherent advantages. Clusters could develop as hubs and encourage a range of downstream activities like supporting plantation, better harvesting, post-harvest treatment and grading. At the other end of the scale, they could become nodes feeding intermediates into higher value-added industry. Taking into account the present assessments of market potential, a number of clusters could be located in different parts of the North-East and other states of India, keeping in

mind the availability of raw material, transportation and communication and proximity to markets.

Bamboo Rounds

Use of bamboo rounds as props in horticultural crops, splints in making agarbattis and woven fine mats has been traditional and would continue to grow. Bamboo rounds may be sized or used as it is. They are used for scaffolding or for props in horticultural crops like tomato, grapes, banana and oranges. The rounds for props are also used as it is; however, polishing can enhance their durability. There is scope for developing and commercialising the cutting and polishing tools. Moreover, rounds can also be used to make peeled bamboo veneer. In yet another application they can be converted into extruded activated charcoal or briquettes. This can be done using a simple apparatus like a drum and carried out by the community itself.

Splints

Bamboo splits are converted into splints using either splint-making machines or manually. Splints locally known as "chola" are used for making incense-sticks, chopsticks and tooth-picks and also woven into fine mats and used as decorative bedcovers or blinds.

Splints can also be converted into a flat form, which is used for making hand fans, ice-cream sticks, rulers and bedcovers. Rounded sticks are used for making pencils.

Splint Weaving Looms

Bamboo splints are woven on weaving

looms using nylon thread. Being a mechanized process this increases productivity manifold. There is potential to introduce these machines in the Indian market to weave mats, bedspreads and venetian blinds. Women can be trained to handle the machines, infact, the industry can be set up to encourage women entrepreneurship in the country. In China, operations like edging and taping to provide the final finish to the product are all done by skilled women workers. This can be done in India too. The nylon mats which have replaced the traditional natural 'Chattai' in Indian homes can be replaced by bamboo mats used as floor spreads and wall covering.

Venetian Blinds

The Venetian blinds being made nowadays are of synthetic materials, but there are experiments to introduce bamboo blinds on a large scale in the organized market. The current size of the Venetian blinds market is in the region of Rs. 3000 crores annually, with the proliferation of offices and showrooms in the urban areas. A meeting with the leading player in the venetian blinds segment, Alps Industries, indicated that a market of at least Rs. 600 crore can be expected annually for bamboo-based Venetian blinds if a mechanised process is available for the same. They were impressed by the bamboo weaving looms that are being used in China and felt that they could also use the same to make Venetian blinds in India.

Bedspreads

Bamboo bedspreads can also be introduced, particularly because they are very cool in summers. They also provide a

good support for the back as well. Feedback from the trade on these bedspreads has been positive and encouraging. Bamboo bedspreads are extensively used in China.

Agarbatti

The current value of the agarbatti industry is placed at Rs. 1,800 crore. The rate of growth has been more than 20 per cent on a year-to-year basis, with production of one million tonnes in quantity terms. Of the total cost of a kg of agarbatti the bamboo stick accounts for at least 7-8% of the cost. Thus the current value of bamboo in the agarbatti market is approximately Rs. 135 crores. There is potential to increase the market further to another Rs. 30 crores by mechanising the splint making process and increasing production (Anon., 2003).

The agarbatti industry is presently concentrated in the state of Karnataka with more than 60% of the total number of agarbatti units (Anon., 2003). The industry is shifting base to the places closer to the North-East region which would reduce transportation costs and provide a fillip to the demand. The growers can command a higher margin for the agarbatti sticks from the industries that are closer and also increase their volume of production with the use of machines.

Pencils

The current trend is to replace wood pencils by either plastic pencils with a lead refill or complete plastic body pencils. Industries are interested in a wood substitute material like bamboo, due to unavailability of wood. There are about 40-50 small pencil industries in the

unorganized sector. The current market size in this sector is approximately Rs. 500 crore (Anon., 2003).

Match Box

Till 1950, majority of the country's requirement of matches was manufactured by one foreign monopoly company, but with the encouragement offered by the government and due to the efforts of KVIC and others associated with the cottage match sector, the situation changed considerably and by 1974-75 small cottage match units contributed 70 per cent of the country's total production of Rs. 80 crores (Anon., 2003). The woods used in the match industry are divided into three categories :

- i. Boxes and splints
- ii. Boxes alone
- iii. Splints alone

Suitable wood for making matchbox veneers grow in India. Semul, the most common match wood, is very good for this purpose but its supply is limited. The ISI has specified 29 species suitable for making splints but these are available only with difficulty. Attempts have also been made to use bamboo and waxed paper for splints. The plywood industry as well as the packing industry competes with the match industry for more or less the same species. The industry is looking for suitable substitutes for wood. Bamboo matchsticks are found to pass all relevant standards for wood match-sticks.

There are numerous other bamboo-based industrial products such as moulded decorative items, baseballs, bicycles, beehives, containers, surf boards, incense-sticks, market acceptance for which is yet in a nascent stage.

Miscellaneous Products

Close to a million tonnes of bamboo is utilised as chopsticks, toothpicks, barbecue sticks, weaving sticks, ice-cream sticks, kites and firecracker industries and also other miscellaneous items such as 'lathis' (sticks) and fishing rods, which are valued at Rs. 186 crores at present; The market for the miscellaneous items can be increased by another Rs. 40 crores using mechanised processes and promoting the use of bamboo in place of softwood (Anon., 2003).

New Generation Products

Bamboo requires to be promoted in different product segments to realize its potential both as environmentally preferred material/product and means for employment generation and revenue earning.

Housing and Building Materials

Bamboo is still however a widely used material for rural, low cost and traditional housing. Bamboo has been a time tested and valued material for housing and continues to be so for communities in rural and urban areas (Laha, 2000). It is easy to work with and most importantly, it is affordable and abundantly available. India abounds in excellent examples of traditional, structurally sound, functional and aesthetic bamboo based uses.

As one of the strongest building materials, bamboo based products are a viable replacement for wood as structural material. Bamboo has been used by people since ages in many ways in construction of doors & windows, interiors, furniture, bridges, ladders, fence poles, supports,

aqueducts, rafts etc. Bamboo in a modern form can substitute plastics, steel and cement for housing needs with the application of sophisticated design knowledge and with the use of improved composite technologies that are available today (Purushotham, 1963; Masani *et al.*, 1977; Janssen, 1981; Schreckenbach and Abankwa, 1983). Components made of bamboo based materials find extensive applications in the housing sector as follows :

- Support structure for shelters (columns, roof trusses, rafts, purloins, scaffolding, ladders etc.)
- Bamboo mat corrugated sheets as roofing material
- Bamboo grid with cement mortar plaster for walls
- Bamboo mat boards for partitions, wall panelling/cladding, false ceiling & shuttering.
- Bamboo mat boards for door and window shutters
- Bamboo composite laminates as door and window frames, flooring tiles etc.

Bamboo can easily be treated with chemicals to make them hydrophobic. Some methods, such as the sap displacement technique, can be used which make it easier to treat bamboo than wood. It has been a well-known practice to coat the bamboo rods with various materials, such as tar, cement and asphalt emulsion, in order to reduce the water absorption potential of bamboo.

Artificial Boards

Bamboo artificial boards are prepared out of primarily processed bamboo materials through a series of mechanical and chemical processes. Woven plywood,

particle board, floorboards, laminated board, pressed boards, compound boards of bamboo and tree timber are some of the products developed showing excellent rigidity and negligible contraction and their structure and size can be easily adjusted according to the constructional and engineering needs.

FRP Doors and Door Frames

With the scarcity of wood for building products, the alternative that merits attention is to manufacture low cost FRP building materials to meet the demands of the housing and building sectors. The doors made of FRP skins, sandwiched with core materials such as rigid polyurethane foam, expanded polystyrene, paper honey-comb, jute/coir felt etc. can have potential usage in residential buildings, offices, schools, hospitals, laboratories etc. As structural sandwich construction has attained broad acceptance and usage for primary load bearing structures, the FRP doors can be manufactured in various sizes and designs using this technology. The FRP Doors could be fabricated by various composite fabrication techniques viz. compression moulding or hand lay-up process. The front and back sheets of the doors are fabricated separately. Wooden inserts are placed between two sheets for various fittings. The PU foam is sandwiched between the sheets by *in-situ* foaming process followed by painting and polishing to meet aesthetic requirement. Proper usage of additives imparts fire retardant properties to the doors. In addition, usage of composite material for the doors makes them totally water and termite resistant.

The FRP doorframes can also be fabricated by contact moulding. A low-density core made of honeycomb or foam

materials provides a structural performance with minimum weight. Other considerations such as sound insulation, heat resistance, vibration-damping etc. dictate the particular choice of material used as core material.

FRP building materials can be used for making door shutters, flooring tiles, roofing sheets, shuttering and scaffolding items and as substitute for ACC/GP/GI Sheets. Fabrication of FRP doors calls for low skill level with low investment requirement. Thus, it can be a cost effective technology for augmenting rural income and employment generation.

Bamboo Charcoal and Activated Carbon

Bamboo charcoal is generally used by goldsmiths. Being superior to other charcoals from other sources, it is used in batteries. In Japan, bamboo charcoal is used in gardening, as it is believed to preserve the moisture available to plants. Carbonized filaments made from bamboo can be used as light-giving source for certain purposes (Varmah and Bahadur, 1980). In order to make charcoal out of over matured bamboo and bamboo of low quality, a portable oven was designed (Inoue, 1988).

Bamboo when processed for slivers, slats, sticks for agarbattis, chopsticks, toothpicks, matchsticks etc. or for value-added products such as flooring tiles, reconstituted wooden block, chip and wafer boards etc; lot of waste is generated. The waste could be in the form of nodes, upper and lower portion of bamboo etc. This could effectively be converted into value-added product such as activated carbon.

Even during the ancient Egyptian culture, the beneficial properties of charred coal were known for improving the quality of drinking water. The modern successor, relying on the same principle and being used in numerous applications, is activated carbon. Activated carbon is a carbonaceous adsorbent with high porosity and hence a large surface area. Commercial activated carbon grades have an internal surface area of 500 to 1500 m²/gm. Related to the type of application, two major product groups exist :

- (i) Powdered activated carbon, particle size: 1-150 micron
- (ii) Granular activated carbon, particle size: 0.50-4.00 mm

Activated carbon mainly consists of elementary carbon in graphite like structure. It can be produced by heat treatment, or "activation" of raw materials such as wood, coal, peat, coconut shell, bamboo and other plantation wood. During the activation process, the unique internal pore structure is created and it is this pore structure, which provides activated carbon its outstanding adsorptive properties.

Activated carbon has good number of applications. In fact, virtually every product manufactured today has been improved upon at least once by the use of activated carbon. In its numerous applications, activated carbon represents a number of different functionalities such as adsorption, reduction (removal of chlorine from water), catalysis (catalyzing various chemical conversions), carrier of biomass (support material in biological filters) and carrier of chemicals (slow release application of colourant).

Fabrics

Bamboo fibres are the newest thing to hit the textile arena. Bamboo is now being made into a fibre that has wonderful characteristics. It has been said to feel like a cross between cashmere and silk. It has fluidity like silk or rayon and a softness of hand like cashmere. This fabric is naturally antibacterial, eco-friendly and is cooler than cotton in warm weather. Hand woven bamboo is the perfect compliment. The folk fashion craze spurred demand for natural, handmade-looking textiles that exude warmth, while synthetic fabrics with a sleek look have also recently been popular.

Bamboo fabrics are made by pure bamboo fibre yarns, which have excellent Wet Permeability, moisture vapour transmission properties, soft feel, better drapery, and easy drying to achieve splendid colours. It is a newly founded, green fabric. Bamboo fabric products include sweaters, bath-suits, mats, blankets, towels, nappies (diapers), underwear and other lingerie, all types of clothing, and linen.

Sanitary Applications

Bamboo sanitary materials include bandage, mask, surgical clothes, nurses' wears, etc. Bamboo fibre has natural effects of sterilization and bacteriostasis, therefore it has incomparably wide foreground on application in sanitary material such as sanitary tower, gauze mask, absorbent pads, food packing and so on. In the medical scope, it can be processed into the products of bamboo fibre gauze, operating coat, and nurse dress, etc. Because of the natural antibiosis function of the bamboo fibre, the finished products need not to be added

with any artificial synthesized antimicrobial agent, so it won't cause the skin allergy phenomena, and at the same time, it also has competitive prices in the market.

Bamboo Shoot Processing

Bamboo shoot is the young culm of a bamboo harvested at the time or shortly after its appearance above the soil surface. It is rich in vitamins, cellulose, amino acids and trace elements and has the same nutritional value as an onion and is a good source of fibre. The average values for various species from different regions for various species are Carbohydrate, 4.5%; protein, 2.6%; fat, 0.3% and ash 0.9% (Maikhuri, 1991). Bamboo shoot comprises 90% water with an edible content between 40 and 50% (Young, 1954). Most bamboo species produce edible shoots. The shoots vary in size and degree of bitterness and most commercially marketed shoots are derived from a small number of chosen species. The Indian bamboo species suitable for producing shoots are *Bambusa pallida*, *B. polymorpha*, *B. tulda*, *B. nutans*, *Dendrocalamus brandisii*, *D. giganteus*, *D. hamiltonii*, *D. strictus*, *Melocanna baccifera* and *Phyllostachys bambusoides*. Bamboo shoots could be hygienically processed and packaged for a good value-addition (Tripathi, 1998). At present, bamboo shoots with limited shelf life, harvested under hot and humid seasons, are largely sold in unprocessed form. Some quantities are also sold dried and preserved with simple additives like salt and lemon. In addition to fresh bamboo shoots, items such as shredded shoots and pickled shoots are also available.

Bamboo shoots can be consumed fresh or processed. Bamboo shoot is used in

oriental cooking as an extender because it takes on the flavour of the ingredients it is cooked with. It is reported that bamboo shoot has the effect in cancer prevention and is very popular in the South-East Asian countries. It is also used to increase the appetite and decrease blood pressure and cholesterol. As a widely consumed vegetable, bamboo shoot can be labelled as a heart protective vegetable and its component phytosterols may be suitable as nutraceuticals. FDA laid down the following specifications for fresh and canned bamboo shoots :

Raw Bamboo Shoots (100g) : 8.3% calcs from fat, 32.7% calcs from protein, 58.9% calcs from carbohydrates

Bamboo Canned Shoots (100g) : 16% calories from fat, 31.3% calcs from protein, 52.7% calcs from carbohydrates.

The bamboo shoot industry, using shoots from both natural forests and bamboo plantations, makes a substantial contribution to the economy and development of rural communities, in which people use bamboo shoot as food and also earn substantial income from bamboo shoot harvesting, preserving, transporting, processing, marketing etc. It provides rural people with income during the lean rainy season when no other major agricultural crops can be produced, as bamboo shoot cultivation is profitable when compared with paddy. One hectare of bamboo plantation yields 4.5 tonnes of bamboo shoots compared with 2.0 tonnes of rice per hectare.

Bioenergy

As is the case for all biomass, use of bamboo, as a fuel is the last in the 5F's i.e.

after use as food, fibre, fodder and fertilizer. The status of utilization of bamboo in India is however at the primary level and with increased development in the usage, there is expected to be surplus available for use as a fuel or newer uses. The gases obtained by converting biomass into usable form of energy by gasification can replace diesel up to 70% for a DG set thus catering to energy needs. The by-products of biomass gasification in the forms of volatiles are rich sources of chemicals. Also conversion of bamboo waste into charcoal by carbonization can supplement rural energy needs (El Bassam *et al.*, 1998).

Employment Generation

In the handicrafts sector which is next only to agriculture in providing employment in rural areas, there is enormous scope for expanding bamboo based handicrafts products. To achieve this, Bamboo needs to be promoted in different product segments to realize its potential both as environmentally preferred material/product and means for employment generation and revenue earning.

Industrial processing of bamboo into panel and structural products, housing components, any other utility items, bamboo laminates for furniture, etc., involve three steps; primary processing, processing into basic components and final processing into utility items. The basic skill of converting bamboo into utilizable items is well known to the tribal/rural populace residing in bamboo growing areas of the country. By providing modern tools and simple processing machines can enhance their skill and quality of products. For primary processing of Bamboo, works like splitting, slivering, etc. can be partly

mechanized, resulting in increased production and promotion of entrepreneurial culture in rural areas and enhanced market potential for resultant bamboo products. Industries being bulk consumer of raw or semi processed bamboo for final products like BMB, BMC, strip board, particle board, etc., should be located in nearby by urban areas.

For manufacture of Bamboo Mat Corrugated Sheets (BMCS), Bamboo mats are the main raw material. As bamboo mats are woven mainly by rural women in bamboo producing regions, the activity provides gainful employment to them throughout the year. Virtually they can weave money at home as part of the process for production of mat. Considering the demand being generated by the market potential of the BMCS, there is need to establish Bamboo Mat Production Centers as Feeder Units for bamboo mat based component manufacturing units to enhance the productivity with improvement in quality of mats in different sizes. The Feeder Unit will provide right quality mats to the BMCS units.

In the bamboo food processing sector, the focus should be on improving the availability, supply chain and shelf life of shoots, processing and packaging under hygienic conditions, marketing etc. With appropriate technology and market support, it should be possible to value add bamboo shoots into preferred products which provides employment and income to cultivators, processors and intermediates engaged at different stages. With minor additions/modifications to the existing equipment, mushroom and other vegetable processing units can add bamboo shoots to their portfolio. With the demand for bamboo shoot showing an

upward trend and the process being labour intensive requiring women-oriented labour, the country in general and North-East region in particular this industry hold tremendous potential to be developed as small scale industrial units to cater to the estimated Rs. 300 crores domestic and export market.

Conclusion

While India has second largest bamboo resources in the world and many people are dependent on it for their livelihood, there is a substantial need to promote the utilization of bamboo to the extent possible. The diversified applications of bamboo had brought attention to prefer bamboo as an industrial raw material for numerous useful products. Value added bamboo products have vast potential for generating income and employment, especially in the rural areas; there is a need to shift focus from the traditional handicraft to value added industrial applications like bamboo mat, boards, flooring, shoot processing which are technology intensive and great potential for employment and income generation. In this context, aspects like low capital investments, requirement of semi-skilled workers, abundant availability of raw materials locally etc. would merit attention in adopting the processing methodologies at rural level. Low cost technology and cost effective composite products could be taken up for commercial production particularly in rural areas.

Recognizing the potential of bamboo and the fact that it has been subjected to neglect, and thus remain disorganized with poor market linkage and sub-optimal level technology application for manufacture of

value added products in the industrial and artisanal sector, the National Mission on Bamboo Technology & Trade Development has taken initiative to upgrade the bamboo economy by according bamboo development a strategic role in rural development, poverty alleviation and bamboo based handicrafts and industrial development.

The potential of Bamboo as an economic resource capable of generating employment for the rural peoples in commercial plantation and other value addition activities has remained largely untapped due to lack of appropriate policy,

institutional framework, covering plantations, technology upgradation, product and market development. Therefore, Bamboo-based cottage and small industries should be promoted under rural poverty alleviation and self-employment programmes. Bamboo plantation may be taken up through participation of various communities, Non-Government Organizations (NGOs) and Self Help Groups (SHGs) under various rural development programmes to meet the raw material requirement of such industrial sectors that would also generate considerable employment mainly in the rural areas.

SUMMARY

Bamboo is an important natural resource in the socio-economic, cultural, ecological and functional context with 1500 well documented uses. Having high strength, elasticity and wear resisting characteristics, it grows rapidly and matures in a short period (3-5 years) with high yield, easy to manage, strong in regeneration, lasts for long time and sprouts new shoots after yearly harvests. It is versatile, low cost, environment-enhancing resource having potential to improve livelihood security both rural and urban areas. Apart from its traditional uses, Bamboo can substitute not only wood, but also other high-priced materials in structural and product applications scientific and engineering innovations. Bamboo sector has vast potential for generating income and employment, especially in the rural areas. The paper presents an account of potential and opportunities for harnessing bamboo based technologies in employment and income generation particularly in rural areas.

Keywords : Bamboo, Applications, Bamboo-based cottage and small industry, Entrepreneurship, Rural Employment.

बांसों की उद्यमिता—ग्रामीण रोजगार के लिए अवसर

वाई०सी० त्रिपाठी

सारांश

अपने भलीभांति प्रलेखित किए 1500 उपयोगों को देखते हुए समाजार्थिक, सांस्कृतिक, पारिस्थिकीय एवं कार्यात्मक सन्दर्भों में बांस एक महत्वपूर्ण प्राकृतिक संसाधन है। ये अधिक मजबूत, लचकदार और घिसने-छिलने के विरोधी गुण वाले होते हैं, तेजी से बढ़ते हैं और थोड़े समय में ही (3-5 वर्ष) परिपक्व हो जाने के अतिरिक्त अधिक प्राप्ति देने वाले, प्रबन्ध करने में सरल, पुनर्जनन कराने में शक्तिशाली, लम्बे समय तक काम देते रहने वाले, तथा वार्षिक कटाई करने के उपरान्त नई कोंपलें उत्पन्न करने वाले होते हैं। ये सर्वकार्योपयोगी, अल्पमोली, पर्यावरण बढ़ाने वाले संसाधन हैं जिनमें ग्रामीण और नगरीय दोनों क्षेत्रों की रोजगार सुरक्षा में परिष्कार करने की संभावनाएं हैं। अपने पारम्परिक उपयोगों के अलावा बांस न केवल लकड़ी की जगह उपयोग किए जा सकते हैं बल्कि वे संरचनात्मक और अनुप्रयुक्त उत्पादों में अन्य अधिक कीमती वस्तुओं की जगह, तथा वैज्ञानिक एवं

अभियान्त्रिकीय नवीनताओं में भी व्यवहार किए जा सकते हैं। आय और रोजगार उत्पन्न करने में, विशेषतः ग्रामीण क्षेत्रों में, बांस सेक्टर की विस्तृत संभावनाएं हैं। प्रस्तुत अभिपत्र में इन संभावनाओं और अवसरों का विवरण दिया गया तथा रोजगार और आमदनी उत्पन्न करने में, विशेषकर ग्रामीण क्षेत्रों में बांस आधारित प्रौद्योगिकियों को कैसे उपयोग में लाया जाए, बताया गया है।

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