Chapter 1

General Introduction

A brief introduction of the present research, appropriate justifications, different applications and objectives fixed for the study are included in this Chapter.
Several opportunities for humanizing rural development are linked to traditional forest products (TFPs). In many countries, rural populations traditionally depend on local forest resources to provide additional income through collection and marketing of TFPs. Where employment opportunities from traditional industries are declining, workers looking for alternative income sources often turn to collection of these products from nearby forests. TFPs provide important employment and income opportunities in several regions.

TFPs are biological and generally not cultivated. Collected in natural forests, these products are usually harvested and processed in small amounts. Bamboo shoots, a TFP, are the young edible bamboo plants that have just emerged from the ground. Bamboo shoots are generally 20 – 30 cm long, tapering at one end and weigh almost to 0.45 kg (Farrelly, 1984). Out of 136 bamboo species available in India (Sharma, 1980), the edible species of the region include *Bambusa pallida*, *B. tulda*, *B. polymorpha*, *B. balcooa*, *Dendrocalamus hamiltonii*, *D. giganteus* and *Melocanna bambusoides* (NMBA, 2009).

Bamboo shoots are important constituents in stir-fry and some traditional items in Asian countries. Presently Asia consumes over 2 million tons of edible bamboo shoots each year (Vaiphei, 2005). India is the second richest country for bamboo production after China. About 426.8 tons of bamboo shoots are harvested every year in the North Eastern states of India (Bhatt et al., 2003); with about 26.2 tons, 435 tons and 426.8 tons of bamboo shoots being harvested only in Sikkim, Meghalaya and Mizoram, respectively (Bhatt et al., 2003). The utilization pattern of fermented, roasted and boiled bamboo shoots is estimated to be approximately 680 tons in the North Eastern states; the highest being in Arunachal Pradesh at 481 tons annually and the lowest in Nagaland at 19.5 tons annually (Bhatt et al., 2005) (b). The total value for world trade of bamboo shoot, in volume terms, is estimated at approximately 0.3 million tones. However, bamboo shoots are short lived, unpreserved and there is no food product from bamboo shoot that has yet made its way into to the national and international markets. Hence, a thriving economy exists around bamboo and bamboo shoot based food items in the national as well as international markets in terms of food security and nutrition. Therefore, there exists a great opportunity for food processing sectors to take up plantation, harvesting, processing and marketing of bamboo and bamboo
shoot based food products in an organized manner. It should, however, be noted that, in selecting an appropriate processing technology for production of bamboo shoot based food items, energy and cost effectiveness should be taken into consideration such that an industrially credible bamboo shoot based food processing sector can be explored.

Food product development consists of a wide range of unit operations that depend on the basic process parameters viz., temperature, pressure, relative humidity, pH, etc. in order to obtain the desired products. Bamboo shoots are amenable to simple processing technologies to produce high value added products, but owing to lack of proper research, it is being unlikely to ensure food security of people through setting up of a bamboo based food industry. The development of an appropriate optimal design was necessary and has been duly expanded to help restrict to the absolute production cost with respect to the conditions associated with available materials, financial resources, protection of the environment, also taking into consideration the safety, operability, accessibility and dependability of the process.

Bamboo shoots are high moisture product, therefore microbial contamination is an ordinary phenomenon during storage, which also accounts for the failure of the development of bamboo shoot based food products with elevated shelf-life (Choudhury et al., 2012). Sorption isotherm describes the equilibrium relationship between water activity and moisture content of food at constant temperature and gives an insight into the moisture-binding characteristic of food. Knowledge of moisture sorption characteristic of fresh bamboo shoots and dried nuggets is important and has been analyzed for prediction of their quality, stability and shelf-life during their packaging and storage (Choudhury et al., 2010).

Sensory evaluation is the ultimate criterion for acceptance or rejection of a food. Sensory attributes of the nuggets that are evaluated by human senses are color and appearance, taste, aroma, surface texture and mouthfeel. Fuzzy Logic is an important tool by which vague and imprecise data obtained from human senses are analyzed and important conclusions regarding acceptance, rejection, ranking and other strong and weak attributes of food can be drawn. Using fuzzy modeling, linguistic variables (e.g., not satisfactory, good, excellent, etc.) were developed and the relationship between independent (color and appearance, taste, aroma, surface texture and mouthfeel) and dependent variables
(acceptance, rejection, ranking, strong and weak attributes) of the nuggets has been constructed.

To wrap up, it is likely that, the technology developed for commercial production of bamboo shoot nuggets will find its acceptance in small-scale sector. It is anticipated hereby, that the research will find application beyond the geographic compass and help craft a strong entrepreneurial element through the superiority maintained all the way through the research passage. In order to fully realize the goal, estimation of cost of the nugget production process is necessary and has been discussed.

Based on the above discussion, the statements of the present research are summarized as below:

• Bamboo shoots are seasonal, perishable, short-lived and unpreserved.
• The processing pattern of the bamboo shoots is traditional, non-standardized and unorganized. Utilization pattern have a little value addition.
• Presence of HCN in bamboo shoots limit consumption of the raw bamboo shoots, making it mandatory for processing.
• A thriving economy exists around bamboo shoot-based food items in the national and international market in terms of food security and nutrition. There exists a great opportunity especially in the organized food processing sectors to take up the processing and marketing of bamboo shoots-based food products in an organized manner.
• Bamboo shoots can be dried, marinated and sautéed can be formed powders, nuggets and can be used as medicine. However, research relating to bamboo-based food products is lacking in national and international scenario.
• Importance of non-traditional forest products (NTFPs) for production of foods over edible traditional food products poses a great role for socio-economical development of the rural people.

In spite of the fact that, bamboo shoots have been an integral part of the diet of the tribal community, scientific validation of traditional processing methods in terms of food quality and safety has not yet been attempted. The integration of traditional processes with scientific validation would help in developing a suitable system for storage and
preservation of this perishable commodity also opening up scopes for rural entrepreneurship. It is therefore, the need of the hour to develop appropriate processing technologies to preserve bamboo shoots in consistent form making them available round the year.

Based on the above aspects, following specific objectives are fixed for the present research:

- To determine the physical, chemical and moisture sorption characteristics of raw bamboo shoots.
- To develop a process technology for production of bamboo shoot nuggets.
- To evaluate the sensory and storage quality attributes of the dried nuggets.

The aim of the research was to develop a process technology to preserve the bamboo shoots in the form of dried nuggets presented throughout the year. The project in attendance begins with information and collection of edible bamboo shoots of the NE region and thereof the development of a process for production of bamboo shoot based nuggets. The report consists of five chapters. Chapter 2 presents literature studies relating to bamboo shoots, their production and consumption statistics, physico-chemical properties of bamboo shoots, importance of HCN in bamboo shoots and its removal techniques, various traditional bamboo shoot based food products and processing techniques. Various experimental techniques, experimental designs and instruments or equipment used to attain the objectives fixed for the research are elaborately described as Materials and Methods in Chapter 3. In Chapter 4, the details of the results are discussed. Summary drawn from the present research are briefed in Chapter 5.