

## **Preliminary observations on ecological and economical impacts of bamboo flowering in Mizoram (North East India)**

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**Abstract**—Gregarious flowering of bamboo *Melocanna baccifera*, followed by famine, is locally known as ‘Mautam’ and appears to occur in an established cycle in Mizoram, North East India. This cycle has been reported to have occurred in 1815, 1863, 1911 and 1959, a regular interval of 48 years. Thus, it is predicted that the next cycle will occur in 2007. The gregarious bamboo flowering in the hilly areas of the state, expected for 2007, has caused panic among the tribal people who fear a possible food crisis and epidemic due to rodent outbreak during bamboo flowering. It has been suggested that famine following bamboo flowering is a result of a combination of two factors. First, it has been reported that the seeds of *M. baccifera* are eaten by the rodents which enhances the rodents’ reproductive ability. Second, the outbreak of rodent populations causes severe losses to paddy crops. Famine is an extreme outcome and there is a need to conduct systematic investigation to determine if these factors are indeed contributing to the famine. The natural ecological phenomenon of flowering has significant ecological and economical impacts on the affected areas.

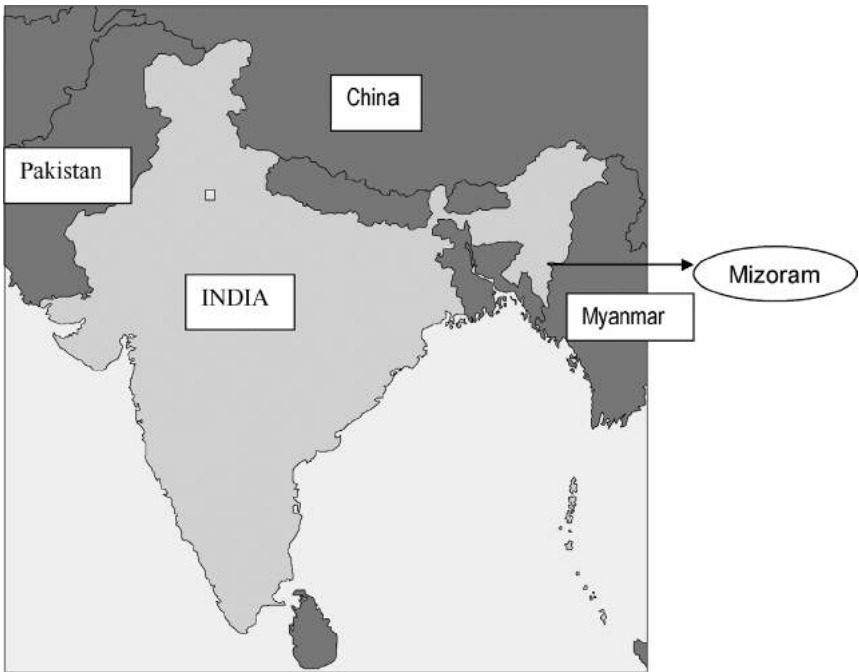
*Key words:* Bamboo flowering; *Melocanna baccifera*; rodent outbreak; famine, economical impact.

### **INTRODUCTION**

The state of Mizoram lies between 20°30’ and 23°15’ N latitude, and 92°16’ and 93°26’ E longitude in the remotest North East of India (Fig. 1). Mizoram occupies an area of 21 081 km<sup>2</sup> and is blessed with rich flora and fauna. The total forest cover was assessed to be 18 338 km<sup>2</sup>, which is 87% of the total geographical area. Dense forest occupies 3786 km<sup>2</sup> and open forest extends over 14 552 km<sup>2</sup>. About 31% of the forest in Mizoram is under bamboo cover, and *Melocanna baccifera* (Table 1) and plays an important role in the rural economy of Mizoram, accounting for 95% of the bamboo forest [1].

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**Figure 1.** Map of India and Mizoram.

**Table 1.**

Growing stock of *M. baccifera* in different forests divisions in Mizoram

Sample	Forest division	Area (km <sup>2</sup> )	Culms		No of villages where bamboo flowering has been reported in 2004 and 2005
			Total ( $\times 10^{-3}$ )	%	
1	Kolasib	598	254 125	35	1
2	Darlawn	339	151 921	21	0
3	Kawrthah	224	85 798	12	4
4	Mamit	183	75 891	10	10
5	Champhai	129	45 061	6	—
6	Aizawl	144	59 800	8	5
7	Tlabung	155	53 088	7	—
Total for all divisions		1772	725 684	100	

The physiology of bamboo flowering is still not fully understood. Bamboos flower only once during the lifetime, and then die. There is a report that bamboo flowering synchronizes with famine years in Mizoram [2]. Gregarious flowering occurs after a long period of time (48 years in Mizoram) in *M. baccifera* and *Bambusa tulda* [3] and in *B. arundinaceae*. Sporadic flowering is recorded in *Dendrocalamus giganteus*, *D. hamiltonii* and *D. longispathus*. Finally, *B. tulda* and *Dendrocalamus*

species are known to flower both sporadically (almost every alternate year), as well as gregariously at long intervals in the north-eastern states of India [4].

## IMPACT OF BAMBOO FLOWERING IN MIZORAM

The major impending problems due to gregarious flowering of bamboo in Mizoram may be summarized as follows.

### *Rodent outbreak and famine*

Sudden increases in rodent populations, resulting in menacing numbers, are well known in India [5], but in Mizoram such increases in rodent populations have been observed to coincide with bamboo flowering. Increases in rodent populations at periodic intervals have also been reported in the past in the neighbouring states of Arunachal Pradesh and Manipur. Besides India, there are also similar reports from Myanmar, Japan and Brazil [6].

It is a common belief in Mizoram that the bamboo flowering gives a big boost to the rat population, although a proper scientific explanation has yet to be found. It is also said that the bamboo seeds, which are favourites of the rodents, increase their fertility to such an extent that the number of their litter increases from the normal 6–8 to 12–18. A sudden availability of nutritious food is likely to increase the prodigality of the local rodent population [6]. *M. baccifera* is the most dominant bamboo species in the state, covering 95% of bamboo forests, and supports large populations of rodents. After exhaustion of bamboo seeds the rodents migrate to the standing crops and damage these [7]. There are also chances of outbreak of an epidemic due to population explosion of rodents.

The reasons for the sudden increase in the rat population after the flowering of bamboo have not yet been established. Considering the chemical contents and their respective quantities in bamboo fruits, the nutritious value does not seem to be so high. The chemical composition of fruit of *M. baccifera* as compared to the seed of rice variety IR-8 is as given in Table 2 [8].

**Table 2.**  
Chemical composition of *M. baccifera* and rice

	Bamboo fruit (%)	IR-8 Rice seed (%)
Starch	50.29	74.65
Proteins	11.55	7.27
Fat	0.23	83.0
Ash	3.03	—
Moisture	9.40	8.75

### *Outbreak of insect pest*

Profuse gregarious flowering in bamboos over large continuous tracts often contributes to the population explosion of the bamboo seed bug [2]. It has been reported in the past that some insect pests appeared during the gregarious bamboo flowering in Mizoram. Swarms of hemipteran bugs appeared in large numbers in the bamboo forests. An increase in the population of grasshoppers and citrus green bugs has also been reported, causing loss to agricultural crops [8].

A swarm of hemipteran insects has been observed in bamboo forests of Mamit, Aizawl and Serchhip districts of Mizoram in June and July 2005. However, damage caused by the insects to agricultural crops has not been observed. The village people collect the insects and extract edible oil from the insects which is used as food. Detailed investigations are being carried out by the authors on the life cycle and behaviour of the insects.

### *Ecosystem level changes due to wild fire and soil erosion*

After flowering the bamboo clumps dry and die and become inflammable in the hot season, when accidental fires may take a heavy toll, resulting also into disappearance of valuable plant species. This period is very critical for the regeneration of bamboo seedlings, as well as for prosperous growth of the tree species in the over wood. Gregarious flowering and drying of bamboo may also result in bare grounds, exposing the soils in the bamboo-dominated areas and increasing soil erosion. Thus, due to various factors effective in the bamboo forests during mass flowering, significant changes occur in the structure and composition of ecosystem of the areas.

### *Reduced supply of raw materials*

In Mizoram, bamboo is extensively used for construction of houses. Before 1972, a large section of the village population were living in houses made chiefly of bamboo. Even now the majority of tribal people living in the southern and western parts of Mizoram (such as Chakmas, Brus, Tlanglaus and Pangs) still live in houses made of bamboo, mainly *M. baccifera*. Farmers conventionally use the cut culms of bamboo as a substitute for teacups. *M. baccifera* is also extensively used to support crops like betel vines, beans, peas and other climbers. Thus, the sharp decline in supply of bamboo due to gregarious flowering significantly affects the rural economy in Mizoram.

After flowering the natural seedlings take the place of the dead crops in about 5–8 years. In order to pre-empt the losses due to gregarious flowering, a possible solution would be the introduction and propagation of clump-forming bamboo in degraded areas. Intercropping of bamboo with agriculture crops under bamboo based agroforestry systems would be a viable system to compensate the loss due to bamboo flowering [9]. By introducing bamboos of varying flowering cycles, it

may be possible to stagger gregarious flowering in a given area to different periods to tide over the sudden stoppage in supplies.

### *Loss of habitat*

Disturbances of suitable habitats due to bamboo flowering may result into reduced population of wild fauna. Different species of wild animals are decreasing gradually as a result of disturbances of the ecological balances in the area. Since habitat requirements of most animals are quite narrow, the loss of suitable habitats eventually leads to extinction of species [10].

Since the bamboo plants die after flowering, it will be at least some years before bamboo plants grow again from seed, leaving bare exposed soil, which could be disastrous in the mountainous region of Mizoram. It was reported that during the bamboo flowering in Mizoram in the late 1950s and 1960s, there was a sharp rise in temperature followed by a spell of dry arid weather, which had a direct negative influence on the health of the people [4].

## CONCLUSIONS

Because Mizoram is covered with a large tract of bamboo forests, gregarious flowering of bamboo has serious economical and ecological impacts on the people of this state. An integrated research project should be launched for management of the impending crisis due to the gregarious flowering of bamboo. It is high time to alert scientists of regional, national and international capacities to interact with the impending danger of famine due to bamboo flowering. By adopting an effective control measure the loss due to bamboo flowering can be turned into profit with relatively small policy initiatives with a sound technical basis.

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