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MAUTAM: GREGORIOUS BAMBOO FLOWERING IN MIZORAM.



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ABSTRACT

Bamboo covers about 6,447sq.kms, occupying 31% of the total geographical area of 21,087 sq.kms of Mizoram. It plays a vital role in the life of the people. In Mizoram, there are three species of bamboos that has regular flowering and fruiting periods, namely, 'Mautak' (*Melocana baccifera*), 'Phulrua' (*Dendrocalamus hamiltonii*) and 'Rawthing' (*Bambusa tulda*). The flowering, fruiting and dying of 'Mautak' is called 'Mautam.'

KEYWORDS : Mizoram , Gregarious Bamboo Flowering , traditional huts.

INTRODUCTION

Mizoram is a State in the North-eastern corner of India. Bamboo covers about 6447 sq.km, occupying 31% of the total geographical area of 21,087 sq.km. More than 20 species of bamboo out of which Mautak (*Melocanna baccifera*) constitutes 77% of the growing stock of bamboos. Bamboo plays a vital role in the life of the people in Mizoram. The young shoots are eaten as vegetable during rainy season and are also often smoke or sun dried for consumption during the off-season period. Bamboo stems are used for making different kinds of domestic products like hats, bigger bamboos as containers for carrying water, for the preparation of the Mizo basket called 'em' which are used for carrying agriculture produce as well as wood, for making the walls of the traditional huts, as tying and binding materials, for fencing the house and gardens etc. Thus, the life of the Mizos is interwoven with bamboo and bamboo products.

Experiences have proved that most bamboo species in Mizoram flower gregariously at fixed intervals and all culms including the one of the current year die after flowering. In Mizoram, there are three species of bamboos that have regular flowering and fruiting periods, namely, *Mautak* (*Melocana baccifera*), *Phulrua* (*Dendrocalamus hamiltonii*) and *Rawthing* (*Bambusa tulda*). The flowering, fruiting and dying of *Mautak* is called *Mautam* and it always coincides with that of *Phulrua*, while the flowering, fruiting and dying of *Rawthing* is called *Thingtam*.

Gregarious bamboo flowering has three implications- *firstly*, there is a need for large scale harvesting, storing and gainful utilization of the materials before the flowering period. *Secondly*, rehabilitation of the gregariously flowered areas becomes a necessity. The *third* is the socio-economic

impact. In Mizoram, the flowering of the bamboos produces large quantity of fruiting which attracts rodents. The rodent increases drastically after feeding on the nutritious bamboo fruits. The enormous multiplication of rodent population is found true all over the world as the availability of food enhances the increase of rodent population. It is also said that the bamboo seeds, which are favourites of the rodents, increase their fertility to such an extent that the physical size of their litter jumps from the normal 6 - 8 to 12 - 18. It is popularly believed that, during the fruiting of bamboos, the rats move in thousands at a time, destroying one field after another. The destruction takes place usually at the dead of night. However, one of the interesting facts is that the rats never leave single or empty glumes of paddy even on the ground. The ear head/ panicles of paddy are cut clean, leaving the plants standing on the fields bareheaded. Once the bamboo fruits get exhausted the rodents start devouring the agricultural crops, often creating food scarcity and often famine in those areas.

From past experiences in Mizoram, the increase in rat population during bamboo flowering not only leads to destruction of crops, but the epidemiological imbalance also leads to increased risk of infection or outbreak of rodent borne diseases such as viral, bacterial, rickettial, parasitic and other diseases like rabies, ringworm etc. It has also been observed that either of the two cycles of bamboo flowering - *Thingtam* or *Mautam*, though they are independent, used to be preceded by a rapid increase in the size of population of two kinds of insects- one is a species of Butterfly and another is *Thangnang*, an oil producing species of bug. Let us look into the chronology of *Mautam* and *Thingtam*, including the expected years of their next occurrences in Mizoram.

Table-1: Chronology of Mautam and Thingtam

Sl.No.	Particulars	Year/ Period
1.	Thingtam	1880- 1884
2.	Mautam	1910- 1912
3.	Thingtam	1928- 1929
4.	Mautam	1958- 1959
5.	Thingtam	1976- 1977
6.	Mautam	2007- 2008
7.	Thingtam	2025- 2026 (expected)
8.	Mautam	2055-2056 (expected)

(Source: Department of Agriculture, Mizoram)

Table-1 shows that the bamboo flowers and dies down at a periodic interval of 48 (+/- 1) years. Both the flowering of *Mautak*, called '*Mautam*' and the flowering of *Rawthing*, called *Thingtam* occur at an interval of 48 years. The gap between the two cycles was found to be almost regular, which is mysteriously 30 years from *Thingtam* to *Mautam*, and 18 years from *Mautam* to *Thingtam*. This type of rodent outbreaks at a periodic interval has also been reported from the neighbouring States, like Arunachal Pradesh and Manipur. Besides India, there are reports from Myanmar, Japan and Brazil.

2. *Mautam* and *Thingtam* based on Mizoram Experiences

Various *Mautam* and *Thingtam* which have taken place in Mizoram are:

1) *Mautam* of 1862: Owing to the lack of authentic records no factual data is available. However, there is a saying that due to age-long isolation and in the absence of proper contact with the neighbouring areas, the *Mautam* famine was very acute and severe. As a result of under nourishment various

epidemics spread and many lives were taken. It is popularly said, till today the surviving people were very lean and thin and the pigs were found leaning on the fencing clenching their teeth due to extreme hunger.

2)Thingtam of 1881: Since contact with the Government had been established the famine was less severe than the previous one. According to Col. E.R. Elite, in his “ Military Report on the Chin-Lushai Hills Country”, about 18,000 maunds of rice and 2,000 maunds of paddy were imported from Cachar, and the Government expenditure was about Rs.1,040 /- which were recovered from sales of trades. It is said that due to numerous death, many corpses were left unburied and a beautiful girl would not fetch a handful of rice. A muzzle-loaded gun, which they valued most highly, would not fetch even its muzzle load of paddy. Many people migrated to Cachar and surrounding areas, where they settled down till today. Actually the Famine of 1881, witnessed the first landmark of the migration of the people into the neighbouring areas of Cachar, Chittagong Hill Tracts, and Tripura etc.

3)Mautam of 1911: When the first officially recorded Mautam Famine occurred in Mizoram in 1911, during the British rule the suffering of the people due to severe scarcity of food stuff was immense. Even the British Government which wanted to avoid high expenditure for the administration in Mizoram had spent about Rs.80, 000/- for importing food grains from outside . There was scarcity of food in the Hills due to the ravages of innumerable swarms of rat. In the previous season, the bamboos had seeded and the supply of food thus provided caused an enormous increase in the rodent population. Although the destruction of paddy and the famine that followed covered the whole District, no starvation death was heard of. The Government having established administration spent about Rs.80, 000 /- for import of paddy and rice from the plain districts to the tune of 700 tons, which were stored at Demagiri, Tipaimukh and Sairang from these boat-beats. It is said that for some far-off villagers, it took three to four weeks to bring paddy. Some Chakmas entered through Demagiri from Chittagong Hill Tracts.

4)Mautam of 1929: The famine of 1929 was worsened by great landslides locally called ‘Minpui’(the great landslides) during which many jhums were destroyed and some rivers diverted their course.

5)Mautam of 1959: The Mizo District authorities had categorically informed the Assam Government that many of the Mizos living in the villages had already seen with their own eyes the rapid increase in the number of one species of insect, called *Thangnang*, sometime in the month of May 1958 .This was regarded as a processor of *Mautam* by the Mizos. In 1958, all the bamboos in the Mizo District seeded. This was followed by increase in the number of rats who devoured all of the crops of 1959. This is the first dreadful natural calamity, which was met with after Independence. As anticipated, the gregarious *Mautam* or flowering of *Melocana baccifera (bambusoides)* had swept the entire Mizo District for the second time in 1959. There was a more terrible famine as a result of the wanton destruction of crops by rats whose population had disproportionately increased in size. But, the Assam Government did not take any pre-emptive measures to combat such a dreadful *Mautam* famine. The belated relief measures taken by the Assam Government to address the menace were also not adequate to meet even the minimum needs of many starving people living in the countryside. There was, therefore, widespread hardship and discontent among the famine-stricken people due to acute shortage of food in the Mizo District. In this connection, Bhat also aptly said: “Relief was inadequate and there was considerable mismanagement in making it available to the affected people. There was widespread

hardship and discontent.” The Government spent about Rs. 89,60,000/- and donations poured in from various organisations including the Indian Peoples Famine Trust Fund, Delhi and the National Christian Council, India, who had donated more than five lakhs of rupees. Never had such a huge sum of money been spent in Mizoram though several such calamities had befallen the people prior to Independence. Rice was despatched to the District via Silchar by all available means of transport- 1,81,652 maunds by air, 2,66,425 maunds by road and 76,461 maunds by boat was sent to the District. Besides, the Government also arranged supplies of about 1182 maunds of rice ex-Jorhat by IAF planes and 16200 maunds of rice of Demagiri from Calcutta via Chittagong. Further, the quantity of rice transported from August 1959 to October 1960 was 5,61,244 maunds. The ‘Mautam’ of 1959 was followed by a severe famine in those areas that left a fear psychosis in the minds of the people.

6) Thingtam of 1977: The last gregarious flowering of Bambusa Tulda was in 1977 in Mizoram.

7) Mautam of 2007: The last gregarious flowering of Muli bamboo (*melocanna baccifera*) was recorded in 2007. According to the Forest Research Institute, Dehradun, the insect locally called Thangnang which is of the Order of Hemiptera and from the Pentatomidae family are not found in normal years. However, swarms of Thangnang were observed at N. Sabual (near Mamit) during May 2006. During 2007, they were again observed in different areas of Mizoram.

Based upon the relevant facts, the experts in Indian Council of Agriculture Research (ICAR), New Delhi had forewarned that in 2006-2007 AD, the gregarious flowering of *Melocanna baccifera* i.e Mautam, is expected again.

The Government of Mizoram set up a State Level Committee on Rodent Control under the Chairmanship of the Secretary of Agriculture, Government of Mizoram. The Directorate of Agriculture, Mizoram is appointed as the State Nodal Agency for Rodent Control.

Acting on the Report of Dr. A M K Mohan Rao, Rodent Specialist, Ministry of Agriculture, Government of India, the State Level Committee on Rodent Control undertake the following components to combat the expected rodent outbreak and it is implemented in the State.

- 1) Survey of Bamboo flowering areas.
- 2) Survey of rodent incidence and their population.
- 3) Publicity / awareness campaign and training.
- 4) Eradication by local rat-traps.

5) Purchase of rodenticides and free distribution to the needy farmers.

2.1 Report on Survey of Bamboo Flowering Areas

In order to conduct survey of bamboo flowering areas in Mizoram, the Directorate of Agriculture, Mizoram set up a survey team, comprising of the Assistant Plant Protection Officer, Subject Matter Specialist (Plant Protection) and Agricultural Field Staff of the concerned District under survey.

Table 2: Observations made through survey of Bamboo flowering areas.

Sl.no	Species of flowering Bamboo	Flowering intensity	Month(s) of occurrence
1.	Melocanna baccifera(Mautak)	Sporadic	(a)February-July, 2002 (b) March - July, 2003 (c) March – July, 2004
2.	Dendrocalamus Hamiltonii(Phulrua)	Sporadic	(a) October-Dec 2001 (b) June, 2002 (c) March, 2004
3	Pseudostachyum Polymorphum (Rawte /Chal)	Gregarious	(a) January - June,2002

(Source: Department of Agriculture, Mizoram)

2.2 Report on Survey of Rodent Incidence and Their Population

Rodents are one of the most notorious pests of crops in Mizoram. They are present throughout the year in crop fields and in rural and urban areas. Among the rodents, rats and mice causes maximum damages to the standing crops and in go-downs. They are also serious household pests chewing on household goods and contaminating foods.

In order to be prepared for the impending rodent outbreak, survey and proper monitoring of a possible rodent population build up is essential. Besides this, identification of major rodent species in forests, field and human habitat of Mizoram is also necessary so that their biology will help in proper management practices.

Rodent incidence and their population was surveyed since 2002 – 2003 by the Department of Agriculture and the findings were as follows:

During 2002 - 2003, rodent incidence was observed in 34 villages, severe incidence was observed in 3 villages -Tlangpui, Tlangpuiteand Parva, moderate incidence in 18 villages and low incidence in 13 villages. These rodents were found attacking standing paddy crop.

During 2003 - 2004, rodent incidence was observed in 16 villages. Moderate incidence was observed in 5 villages and low incidence in 11 villages.

Rodent incidence in the sporadic bamboo flowering areas is not observed /noticed.

Rodent incidence /infestation is measured by a scale of –

upto 25 burrows/hectare	-	Low
25 to 50 burrows/hectare	-	Moderate
50 to 100 burrows/hectare	-	Severe

2.3 Publicity, Awareness Campaign and Training

In order to be ready for the coming Mautam, educating people on rodents and their control is one of the most important aspects. Besides Mautam, knowledge on rodents is also necessary for everyday life of a farmer, and also for the people living in rural and urban environment.

a) Training of farmers in the rural areas is being conducted in combination with training on other agricultural practices. Farmers were trained in the biology of rodents and use of rodenticides. Practical

works were also done in the fields whenever possible. About 40 villages have been covered for farmers training since 2002-2003, and the training programme is still going on to cover as many towns and villages as possible.

b) In combination with conducting training for the farmers, leaflets, notes and booklets on rodents and their control were distributed to the farmers.

c) A regular weekly programme on rodents and their management is also being conducted through All India Radio, Aizawl and Lunglei stations. A documentary film on the same topic is being prepared, which will be utilized in the training programmes and, also for a presentation through the audio-visual medias, such as Doordarshan and local Cable TV networks.

d) Time and again, field staff of the Department are being sent for training on rodent and rodent management to institutions outside the State. During the current year of 2004-2005, 2 (two) field staff are proposed to undergo training on management of rodents at Hyderabad. A Central Government Rodent Management Team also propose to visit Aizawl during 2004-2005 to impart training to the field staff of the Department.

2.4 Eradication of Rats by Traps

Use of local rat-traps proved to be one of the most successful method for control of rodents, both in the fields and in the households. Farmers will be financially provided or given assistance in use of local rat - traps.

Design and testing of LTBS (Linear Trap Barrier System) is proposed to be conducted for trapping of rodents in the fields and forests areas. LTBS has been proved to be successful in many South East Asian countries.

Use of Multiple Capture Trap may be successful in case of a group of rodents. This type of trap can be easily used along with the LTBS.

2.5 Purchase and Free Distribution of Rodenticides to the Needy Farmers.

Use of rodenticides for controlling of rodents is still found to be successful. There are two types of rodenticides commonly used in Mizoram. They are - Zinc Phosphide and Bromodiolone. Besides these two, Coumatetralyl has also been introduced recently in Mizoram.

These rodenticides are purchased and distributed free of cost to the farmers according to their needs. The farmers were instructed on the use of these rodenticides.

3. Adverse Effects of *Mautam* and *Thingtam* on the Socio-economic Life in Mizoram

To find the correlation between variables, Pearson correlation is used. Multiple regression analysis is employed to find out the effects of expected yield.

Table 3: Impact of the *Mautam* of 2007 in different districts:

Sl. No.	Districts	No. of affected villages	No. of affected families (jhumia)	Total area of damages (in Ha.)	Expected yields from affected areas (In MT)	Losses from affected areas (in MT)	Yields from affected areas (in MT)	% of crop loss from affected areas	Total loss in terms of Rupees @ Rs. 20,000/- per MT
	1	2	3	4	5	6	7	8	9
1.	Lawngtlai	79	6,115	3,999.6	2,100	2,070.5	29.5	98.5	41,410,000
2.	Saiha	65	2,889	2,616.5	4,118.2	4,108.0	10.2	99.7	82,160,000
3.	Mamit	83	7,619	5,203.9	8,196.0	6,126.2	2,069.8	74.7	1,22,524,000
4.	Aizawl	95	7,234	5,629.6	5,673.4	5,017.5	655.9	88.4	1,00,350,000
5.	Lunglei	170	28,574	4,854.0	7,584.0	7,396.0	188.0	97.5	1,47,920,000
6.	Serchhip	43	3,745	2,897.5	5,119.3	4,563.5	558.8	89.1	91,270,000
7.	Kolasib	30	3,602	3,127.9	3,231.3	3,171.8	59.5	98.7	63,436,000
8.	Champhai	93	8,821	5,184	10,120.6	5,793.6	4,327.9	57.2	1,15,872,000
	Total	659 (84.5%)	68,599 (72.5%)	33,513	46,142.8	38,247	7,895.8	82.88	7,64,942,000

(Source: Record of Department of Agriculture, 2007)

Table 3 shows that out of the total of 780 villages within the state, 659 villages were affected by the occurrence of Mautam. 68,599 Jhumia families felt the impact of the bamboo flowering and rodent upsurge, accounting to 72.5% of the total number of jhumia families in the state, where there exist 94,633 jhumia families out of the total of 1,76,134 households. The worst affected in terms of area is Aizawl District. Saiha district is the worst affected in terms of percentage of loss of crops which is also least affected in terms of area. Champhai area is the least affected in terms of loss of crops. When studied in terms of monetary loss Lunglei district bore the brunt whereas Lawngtlai district had the least financial loss.

Table 4: Correlation between the variables:

Variables	Yield	Affected village	Affected family	Area damages
Affected village	.106			
Affected family	-.005	.923**		
Area damages	.532	.632	.468	
District	.489	-.084	.125	.078

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows the relationship between the variables. It is clear that affected village, area damages, district and yield are positively correlated. There is negative relationship between affected family and yield and district and affected village. Besides, affected family and affected village, area damages and affected village, area damages and affected family, district and affected village are also positively correlated and the correlation between affected village and affected family is significant at 1% level. So, this correlation has significant impact on yield of the crops.

Table 5: Multiple regression analysis with affected villages, affected family and area damages as the predictors and yield of a crop as a criterion:

Variables	β	SE	t	P-value	95% CI for β	
					Lower	Upper
Constant	-4503.86	2302.57	-1.96	0.15	-11831.65	2823.94
Affected village	46.83	48.63	0.96	0.41	-107.92	201.58
Affected Family	-0.26	0.21	-1.24	0.30	-0.94	0.41
Area Damages	0.42	0.65	0.65	0.56	-1.64	2.48
District	466.73	265.16	1.76	0.18	-377.13	1310.58

The regression coefficient of predictor variable affected village was 46.83, but it was not significant with $p = 0.986$, indicating that affected village does not have significant impact on the yield of crop. Similarly, the regression coefficient of area damages (0.42) and district (466.73) are positive, which is not significant. So, area damages and district also does not affect the yield of the crop with standard error 0.65 and 265.16. Further, the regression coefficient of affected family was -0.26, which is also not significant at 5% level. Hence, affected family also has no affect on yield of a crop with standard error 0.21. From the result, we can conclude that all the variables will not be able to use to predict the yield of a crop. And R^2 value is 0.69.1, it indicates that 69.1% percent of the yield was affected by affected village, affected family, area damage and district.

Table 6: Area affected and loss during 2006-2007.

Sl. No	Name of crop	Total area (ha)	Area damaged (ha)	Loss of production (MT)
1.	Paddy	40,935.58	10,122.00	12,620.86
2.	Maize	10,775.00	6,965.00	9,851.00
3.	Sugarcane	972.00	158.00	3,861.11

(Source: Mizoram Mautam, 2007, Department of Agriculture (CH))

Table 6. shows that maximum damage was caused to paddy as compared to other crops. This is because it is the major crop grown in the state, as rice is the staple food of the Mizos.

Table 7: Rice Production in Mizoram

Year	Production (in MT)
2004- 2005	75,362.7
2005-2006	75,418.0
2006-2007	29,464.4
2007-2008	11,662.4

(Source: Department of Agriculture)

Table 6 shows that the production of rice had started dwindling from the time that bamboo

flowering was observed. It continued declining and during the period of Mautam, that is, 2007-2008, production was reduced to an all time low.

Table 7: Rat Tails bought by the Department in 2007-2008

Sl. No.	District	Rat tails bought (nos.)	Amount in Rupees
1.	Aizawl	3,14,942	6,29,884
2.	Lunglei	1,89,414	3,78,828
3.	Mamit	1,70,445	3,40,890
4.	Kolasib	1,27,063	2,54,126
5.	Champhai	2,223,500	4,47,000
6.	Saiha	94,993	1,89,986
7.	Serchhip	1,58,043	3,16,086
8.	Lawngtlai	1,77,168	3,54,336
Total		14,55,568	29,11,136

(Source: Mizoram Mautam, Department of Agriculture, 2007)

Table 7 highlights the rats tail that was bought in 2007-2008. Rats tails were bought by the Department of Agriculture as a rodent control measure the rodent upsurge. The maximum number of rat tails were bought from Champhai district and the minimum number from Saiha district. However, this does not seem to co-relate with the crop loss or the area affected.

4.CONCLUSION:

It has been observed that, in Mizoram, the abundant rodent in jhums and bamboo forests- *Rattus rattus brunneusculus*, breeds all the year round with a peak during monsoon, a typical periodicity of reproduction found in tropical rodents. Moreover, the rodents collected during the years when bamboos were flowering, did not provide the type of breeding which could initiate an outbreak of population. It is, therefore, quite possible that paddy devastation is caused by the mass migration of rodents from jungles to jhum cultivation. No matter what the cost, it has been seen that Mautam has caused and still causes a lot of crop destruction. However, these occurrences can be predicted as had been done before, therefore, the Government as well as the farmers can take precautionary measures. In fact, as has been seen from past experiences, the initiatives taken by the Government to combat the bamboo flowering has to a great extend reduced the destruction of crops and impact on the people.

REFERENCE:

- 1.Bhat, Sudhakar. The Challenge of the North-East, (Popular Prakashan Pvt. Ltd.,Bombay, 1975), p.64.
- 2.Department of Agriculture (Crop husbandry), Mizoram. Brief Record on Mizoram Mautam 2007-2008. p 1.
- 3.Department of Agriculture, Mizoram, Record of Mautam.
- 4.Government of Mizoram. Bamboo Flowering-A Report, 2005, Agriculture Department.
- 5.Government of Mizoram.Records of the Department of Agriculture.
- 6.Government of Mizoram. Report on 'Rodent Control in Mizoram,'Department of Agriculture.
- 7.Individual Narrative given to James Lalsiamliana, Assistant Plant Protection Officer, Department of Agriculture, Government of Mizoram, by C. Lalbiaknnema, Republic Veng, Aizawl, on November 14,

2002.

8.Lalnilawma (2013).Bamboo Flowering Induced Famine and Coping Mechanisms of shifting Cultivators, New Delhi: Akansha Publishing House .

9.Lalrintluanga. (2007) Indian Journal of development Research & Social action, Vol. 3(1), January-June, pp 119-140.

10.Lalsiamliana, James. APPO. Gregarious Flowering of Bamboo and Rodent Outbreak in Mizoram, p.1.

1.Lalnilawma (2013).Bamboo Flowering Induced Famine and Coping Mechanisms of shifting Cultivators, New Delhi: Akansha Publishing House .

2.Department of Agriculture (Crop husbandry), Mizoram. Brief Record on Mizoram Mautam 2007-2008. p 1.

3. *ibid.*, p.2

4.Lalrintluanga. (2007) *Indian Journal of development Research & Social action*, Vol. 3(1), January-June, pp 119-140.

5.James Lalsiamliana, APPO. *Gregarious Flowering of Bamboo and Rodent Outbreak in Mizoram*, p.1.

6.Government of Mizoram.*Records of the Department of Agriculture*,

7.*Individual Narrative* given to James Lalsiamliana, Assistant Plant Protection Officer, Department of Agriculture, Government of Mizoram, by C. Lalbiaknnema, Republic Veng, Aizawl, on November 14, 2002.

8.Bhat, Sudhakar. *The Challenge of the North-East*, (Popular Prakashan Pvt. Ltd., Bombay, 1975), p.64.

9.Government of Mizoram. Bamboo Flowering-A Report,2005,Agriculture Department.

10.Department of Agriculture, Mizoram, *Record of Mautam*.

11.Department of Agriculture, Mizoram, *Record of Mautam*.

12.Government of Mizoram. Report on 'Rodent Control in Mizoram,'Department of Agriculture.

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