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Lac production and its economic return to rural economy in Rajshahi Division, Bangladesh

Nure Ferdousee^{a,†}, M. Julker Nayen^b, A.T.M. Rafiqul Hoque^{a,b}, Mohammed Mohiuddin^b

^a Graduate School of Engineering and Science, Laboratory of Ecology and Systematics, University of the Ryukyus, Japan/^b Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong 4331, Bangladesh/[†] communicating author, email: nure300679@gmail.com

Abstract— The study describes the status of lac cultivation and its economic return in the North-Western region of Bangladesh. Number of families involved in lac growing, distribution of host plants, land area used for the cultivation of lac, production of raw lac in different host plants, period required for the production of lac were determined. The number of families involved in lac growing activities decreased with time. Among the distribution of the host plants, Kul (*Zizyphus mauratiana*) was found to be pioneer, major and the most preferable host plant compare to Raintree (*Samanea saman*), Babla (*Acacia nilotica*), Khair (*Acacia catechu*) and Polash (*Butea monosperma*). On the basis of lac production from a mature tree, Shirish (*Aibizia saman*) was found to be the highest (80kg.) producer followed by Kul, Khair, Polash and Babla. While compared to other landuses, lac was found to be profitable as it provides higher economic return.

INTRODUCTION

Lac, popularly known as shellac, in its refined flake form, is the resinous substances secreted as a protective covering by a tiny lac insect, *Laccifer lacca*, which is found as a parasite on a number of both wild and cultivated plants [1]. It has outstanding properties and exceptional versatility that is unusual to any synthetic resin due to its unique combination of chemical, mechanical, thermal and electrical properties [2]. Lac insects can be cultured over a fairly wide range of the tropics and sub-tropics and on a large number of host trees [3]. About 70% lac of the world is produced in India and they capture the highest position in the production and export of raw lac and lac products at the world market. Thailand is the second largest lac exporter after India with about 35% of the world market [4]. Lac has been cultivated in about three hundred hectares of land annually in Bangladesh from which is able to provide 180 tons of crude lac [5]. Though statistics are quite unreliable, it has been reported that currently national production of lac is around 700 tonnes per year while the demand is estimated of about 15 times of that quantity [6]. The Lac Research Division, BCSIR Laboratories, Rajshahi has developed some products from lac having great potentials in the industrial sector of Bangladesh [7]. The success of lac cultivation largely depends on the nourishment of the lac insect. Loamy soil is suitable for the growth of lac hosts. The lac growing region (Rajshahi, Nababgonj and Naogaon) is characterized by extreme environmental conditions, such as low and erratic rainfall, extreme temperature (both high and low) and an undulating terraced

landscape. The soil on the summits and terraced slopes are imperfectly or poorly drained, grey or mixed grey and brown in color and silty loam to silty clay loam in texture [8]. The mean annual temperature of this division is 31°C and the temperature may rise up to 40°C in the month of April while the temperature may fall into 10°C in the month of December [9]. The average annual rainfall of this division is recorded as 1235 mm whereas it is 300 mm in the winter. The average humidity is recorded as 80% annually.

Though the lac cultivation and its marketing aspect have a tremendous prospect on the socio-economic development of the rural poor of our country, the research work and documentation in this field is very scanty and generally piecemeal in nature. No study has so far been conducted in a holistic way with regards to its cultivation, management, socio-economic importance. Its present status, contribution to the family and national economy and future prospects are unknown. If we can manage the host plants of Nababgonj zila, we will get 400 tones of raw lac which has a market value of 3 crore taka and can provide job facilities to 20,000 landless and marginal farmers [5]. In these circumstances the present study is an effort to know the present status of lac production and its economic return in the North-Western region of Bangladesh.

MATERIALS AND METHODS

Site selection

Rajshahi division was selected for the study because of its importance as a lac growing area of the country. Available lac growing areas of this division namely Chapainababgonj, Rajshahi and Naogaon Districts were selected because lac is cultivated traditionally in these areas from a long period. Four upazillas namely Shibgonj and Gomostapur from Chapainababgonj; Godaghari from Rajshahi and Niamatpur from Naogaon were selected for the study on the basis of availability of the villages and respondents involved in lac growing activities. Eight villages: three from Shibgonj, one from Gomostapur, two from Godaghari and two from Niamatpur were selected on the basis of available lac grower of different categories.

Land holdings and historical background

On the basis of total land holding area, the households of the lac growers were categorized into Landless (Up to 0.20 hectare), Marginal (0.21-0.50 ha), Small (0.51- 1.0 ha), Medium (1.01-2.0 ha) and Large (>2.0ha) in the following five groups [10]. Six household respondents of each

household category were selected. To know the historical background of lac production activities in the areas the respondents and the experienced persons of different ages were interviewed using a pre-prepared questionnaire where most of the questions were open ended in order to get explanatory answers. Persons of maximum age were given preference to know the number of families involved in the production of lac since the beginning of lac cultivation.

Data collection and analysis

Data on distribution of host plants, area covered by the lac cultivation and other crops, management and production aspect of lac, were considered for the study.

Distribution of the host plants

To know the distribution of the host plants, five major host plants were selected and the numbers of each host plants were recorded from each household category. The distribution of each host plant species was calculated as percentages of total host plants of all species.

Area covered by the cultivation of lac and other crops

The land area covered by the lac cultivation and other crops were recorded from each household category and was converted into percentage. The annual economic return from that land was noted for each household category of the lac growing areas.

Management and production

To know the management of the host plants, the farmers of the different household categories of the lac growing area were interviewed using a pre-prepared questionnaire. The annual production of raw lac of different household categories was also recorded.

Potentiality of host plants

The potentiality of different host plants of similar age in the production of various form of lac was determined taking information from 30 households of five different household categories of the study areas. The production variation in different seasons of lac growth was also evaluated interviewing the farmers using a pre-prepared questionnaire. Mean and standard error of mean were calculated using statistical package.

RESULTS

In the study area the involvement of families in the lac production activities has been observed since long before. Over the period of time, the number of families involved in the lac production activities has been decreased considerably with the increase of time (Table 1).

It is also revealed that 46% families of entire lac growing area were engaged in the production of lac before the year of 1992 and the involvement of lac growing families has been gradually declined towards the year of 1992 (41%), 1997 (36%) and 2002 (30.25%).

Table 1. Number of household involved in lac production activities at different lac growing areas (upazilla) since the beginning of lac cultivation. Values are % of family number.

Year	% of household family number in lac production activities				Mean Total
	Shibgonj	Gomostapur	Godagari	Niamatpur	
~ 1992	34	50	47	53	46
1992	31	44	41	48	41
1997	22	38	39	45	36
2002	16	39	37	39	30.25

Considering four different lac growing upazillas, before the year of 1992 the involvement of families in lac production activities was more in Niamatpur (53%) than that of Gomostapur (50%), Godagari (47%) and Shibgonj (34%) but the involvement of families in lac production was sharply declined at Shibgonj upazilla (34 -16%) followed by Gomostapur (50-29%) compare to that of Niamatpur (53 -39%) and Godagari (47-37%) up to the year of 2002 (Table 4.1).

Table 2. Percentage distribution of various host plants in four different lac growing areas (Upazilla). Values are mean of 30 observation ± standard error of mean.

Name	Lac Growing Area (upazilla)				Mean
	Shibgonj	Gomostapur	Godagari	Niamatpur	
Kul	44.0 ±0.459	46.2±0.028	49.6± 3.42	59.6± 4.66	49.85
Polash	10.4±0.007	11.8±0.012	9.0± 0.04	7.8±0.21	9.75
Raintree	12.8±0.015	24.2± 0.930	13. 6± 0.020	11.8±0.01	15.6
Babla	20.0±0.106	10.0± 0.361	14. 6± 0.26	8.8±0.002	13.35
Khair	16.2±0.32	7.8± 0.021	12.6±.013	9.2± 0.32	11.45

Among the host plants the distribution of Kul was significantly dominant (49.85%) in all lac growing areas, where Raintree (15.6%) was in second position followed by Babla (13.35%), Khair (11.45%) and Polash (9.75%) as 3rd, 4th and 5th position (Table 2).

As shown in the Table 3., it is clear that the economic return is higher from lac cultivation than the cultivation of other crops in relation to the proportion of land used. The area of land used for lac cultivation increases considerably with the increase in land area of better household categories. The results also showed that the percentage of land covered by the cultivation of lac was higher in Shibgonj upazilla (10-25%) than that of Gomostapur (5-18%), Godagari (10 -20%), and Enayatpur (8-20%) and the percentage of land cover increases with the increase in area of land holdings of household categories (Table 3).

Among the host plant species Sirish was more potential in the production of raw lac (80 kg/tree) and the species Kul was in second position (20kg/tree) in this respect followed by the species Khair (12kg/tree), Polash (10kg/tree) and Babla (8kg/tree) (Table 4.4). The result also showed that the amount of shellac was almost half of the raw lac.

Table 3. Percentage distribution of land covered by the cultivation of lac and other crops and their contribution to economic return in various household categories of different lac growing area (Upazilla). Values are mean of six observations ± standard error of mean.

Farmers category	Shibgonj		Gomostapur		Godaghari		Niamatpur	
	Land (%)	Return(Tk.)	Land (%)	Return(Tk.)	Land (%)	Return(Tk.)	Land (%)	Return(Tk.)
Large	25±0.930	25000±41.57	15±0.026	12000±428.18	12±0.014	8000±341.57	10±0.361	5000±88.19
Medium	20±0.106	15000±40.82	20±0.106	15000±40.82	8±0.038	8000±341.57	5000±88.19	5000±88.19
Small	15±0.026	12000±428.18	10±0.006	8000±341.57	8±0.038	8000±341.57	5000±88.19	5000±88.19
Marginal	12±0.014	8000±341.57	8±0.038	8000±341.57	8±0.038	8000±341.57	5000±88.19	5000±88.19
Landless	10±0.361	5000±88.19	5±0.016	12000±28.18	5±0.016	8000±341.57	95±0.880	15000±40.82
Others	90±0.714	12000±28.18	95±0.880	15000±40.82	92±0.067	17000±238.20	10±0.373	5000±88.19
Lac cultivation	5000±88.19	5000±88.19	8000±341.57	8000±341.57	10000±401.39	10000±401.39	8000±341.57	8000±341.57
Others	12000±28.18	12000±28.18	15000±40.82	15000±40.82	10000±401.39	10000±401.39	8000±341.57	8000±341.57
Lac cultivation	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57
Others	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82
Lac cultivation	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57
Others	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82
Lac cultivation	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57	8000±341.57
Others	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82	15000±40.82

Table 4. Potential of different host plants of similar age for the production of various form of lac in lac growing areas (Upazilla). Values are mean of 30 observations ± standard error of mean.

Form of lac	Lac production (kg)/host plant species.				
	Kul	Polash	Sirish	Babla	Khair
Raw lac	20 ± 0.30	10 ± 0.22	80 ± 0.86	8 ± 0.31	12 ± 0.42
Granular lac	12 ± 0.42	6 ± 0.20	45 ± 0.49	5 ± 0.20	7 ± 0.24
Shellac	10 ± 0.22	4 ± 0.17	40 ± 0.42	4 ± 0.17	5 ± 0.20

In case of Kartiki crop the production of raw lac by all host plant species was almost double than that of production in Baishaki crops except the host plant Khair where the lac production of Baishaki crop was more than that of Kartiki crop (Table 5). While considering overall production of raw lac from the host plant species, Sirish was found more in the area of Gomostapur and Godaghari. The Kartiki crop required four months while the Baishaki crop required eight months to harvest.

Table 5. Potential of different host plants of similar age for the production of raw lac (kg) of Kartiki (K) and Baishaki (B) crop in different lac growing areas (Upazilla). Values are mean of six (6) observations ± standard error of mean.

Local name	Shibgonj		Gomostapur		Godaghari		Niamatpur	
	K	B	K	B	K	B	K	B
Kul	20 ± 0.40	12 ± 0.34	20 ± 0.40	10 ± 0.26	20 ± 0.40	8 ± 0.26	20 ± 0.40	10 ± 0.26
Polash	10 ± 0.26	6 ± 0.26	10 ± 0.26	5 ± 0.54	10 ± 0.26	5 ± 0.54	10 ± 0.26	5 ± 0.54
Sirish	50 ± 0.52	30 ± 0.49	60 ± 0.34	30 ± 0.49	65 ± 0.54	40 ± 0.34	50 ± 0.52	35 ± 0.54
Babla	8 ± 0.26	5 ± 0.54	10 ± 0.26	6 ± 0.26	10 ± 0.26	6 ± 0.26	10 ± 0.26	5 ± 0.54
Khair	12 ± 0.34	15 ± 0.34	12 ± 0.34	15 ± 0.34	10 ± 0.26	16 ± 0.54	10 ± 0.26	15 ± 0.34

DISCUSSION

The numbers of families involved in lac cultivation activities have been decreasing significantly with the increase of time (year) in agreement with the result of Mustafa [6], who found considerable decrease of family number from 5000 to 2500. The mean percentage of families involved in lac cultivation activities was 46 up to the year of 1992, but now it is only 30.25% and the main causes for this are lack of marketing facilities, lack of government and NGO support and constant harassment of the BDR and the other law enforcing agencies. Among the distribution of the host plants with the farmers of different categories Kul (*Zizyphus mauratiana*) has been determined as pioneer and the most preferable host plant compare to that of other major species like Raintree (*Samanea saman*), Babla (*Acacia nilotica*), Khair (*Acacia catechu*) and Polash (*Butea monosperma*) as Kul provide fruits in association with the lac.

The area of land used for the cultivation of lac increased considerably with the increase of land holding of different household categories. However the small area of land involved in lac cultivation can provide more lac along with other products than the large area of land involved where the land usually utilized for the production of other crops. As a supplementary economic activity, lac production occupies the highest position in generating income and employment for the rural poor similarly in a study supported by the Lac Research Center (LRC) [5], Chapainabgonj achieved 3/4 times profit from lac cultivation along with other crops like paddy, wheat, turmeric and arum (mukhi kochu).

The production of raw lac varied in different host plants. On the basis of lac production from a mature tree, Sirish (*Aibizia saman*) was in highest position (80kg.) followed by the positions of Kul (*Zizyphus mauratiana*), Khair (*Acacia catechu*), Polash (*Butea monosperma*) and Babla (*Acacia nilotica*). The amount of shellac produced from the raw lac was almost half of raw lac after processing as reported by Lac research center, Chapainabgonj.

The production of raw lac varied with the change of season and in host plants significantly. The production of Kartiki crop in various host plants was about double in comparison to that of Baishaki crop although the period

required for the production of Baishaki crop was almost double (8 months) than the Kartiki crop (4 months). But there was an exception in Khair trees where the Baishaki crop production was higher than the Kartiki crop as the production of lac in Khair tree was not hampered by the strong wind, water deficiency or temperature.

The climate, soil and other conditions of our country are favorable for the cultivation of lac. The cultivation is restricted only in a few numbers of districts of the North-Western region of our country. Lac cultivation can be expanded to the other parts of our country easily if proper initiatives should be taken.

As a supplementary economic activity lac production can generate income and employment opportunities for the landless and marginal farmers especially during the agricultural off season. From a research of Alam and Sarker [5] and Mustafa, [6] it was estimated that 20,000 (Twenty thousand) employment opportunities could be created with appropriate management of all host plants available at Chapainababgonj.

CONCLUSION

Lac cultivation and its production process have been practiced in Bangladesh especially in the North-Western region of our country. It is considered as a cottage industry and a supplementary economic benefit in the region. Adverse environmental condition, uncontrolled border trade, lack of Institutional & policy support, lack of training & research, lack of financial support, lack of marketing facilities, Police & BDR harassment are the main causes of the depletion of lac cultivation and production. Illegal entrance of lac through the borders should be checked at any cost by the cordial participation of the government, various law enforcing agencies and the people related with the production of lac.

The present status of lac in the region is in a very poor condition. The lac growers are giving up this profession because they are not properly evaluated and encouraged and in the cultivation, production, processing and marketing of lac. The government should take proper initiative to supply the lac growers with credit facilities, bank loan and arrange training on the scientific management of lac. Although the climate of the whole country is suitable for the cultivation of lac, it is restricted only in the few northern districts. The increase in production will minimize the import of lac and lac products from other countries. Thus a lot of foreign exchange can be saved. If all the districts of our country can be brought under lac cultivation, there is no need to import lac from other countries.

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