Dependency on Lac Cultivation of the Households - A Study of a Village in Purulia District, West Bengal

Souvik Dasgupta
Assistant Professor, Department of Economics, Sidho-Kanho-Birsha University, Purulia

Parul Deoghoria
Guest Lecturer, Department of Economics, Nistarini Women's College, Purulia

Abstract

The present study is an attempt to examine the dependency of the lac cultivating households on the earnings from the lac cultivation. The study also tried to determine the factors responsible for the variation in the relative contribution of the returns from Lac cultivations across the Lac cultivating households. For this purpose a household survey was conducted in the Karmadi village, Purulia district, West Bengal. The study noticed gross earning is moderately responsive to changes in Lac earnings. The volume of land possession of host trees and the total working members in Lac cultivation are found to be the most important factors determining the variation in proportional Lac earning for the sample households.

*Keywords: **Lac**, Dependency, Purulia*
JEL Classification: Q12, L73

1. Introduction

Lac is a natural, renewable, bio-degradable, non-toxic resin produced by the tiny insect known as Kerria lacca (Kerr) on the tender twigs of specific host trees viz., Palas, Ber , Kusum, Khair , Peepal etc. The secretions from the insects form a hard continuous encrustation over the twigs. The encrusted twigs are further scraped off, dried and processed. Lac has a wide variety of application in pharmaceutical, paint, electrical, automobile, cosmetic, adhesive, leather, wood finishing and other industries.

There are several forms of lac viz. Stick lac (or crude lac or raw lac), Seed lac, Stick lac (Chowri) ,Shellac, Button lac , Garnet lac , Bleached lac (Chattopadhyay, 2011).Raw lac is the source of three crucial natural and renewable products viz. resin, dye and wax. Now a day it is also used in fruit coating.Lac cultivation is an important source of livelihood resource for poor farmers, which is an assured source of income during drought years (Chattopadhyay, 2011). It is a highly remunerative crop, paying high economic returns to the farmers and also foreign exchange to the country through its export. It has high potential for generating employment for both men and women in forest and sub-forest dwellers in different parts of

the world.

Lac is mainly produced in India, Thailand, Indonesia, parts of China, Myanmar, Philippines, Vietnam, Cambodia etc. and India is the largest producer of lac in the world(ICAR,2016). In India it is cultivated in the sub-hilly tracts of Jharkhand, Chhattisgarh, Madhya Pradesh, West Bengal, Maharashtra, Assam and Odisha. The overall, production of the lac in the country has been estimated to be 18746 tons in 2015-16 (ICAR, 2018). A total 183 lac processing units were functional in the country out of which 114 (with 93 in Purulia) are in West Bengal during the year 2015-16. There are 8 primary and 6 secondary markets existing at national level, in which annual arrival of sticklac was more than 500 tons out of which 3 primary and 1 secondary markets are in West Bengal. In West Bengal the primary markets are in Balarampur, Jhalda and Tulin, whereas the secondary marketsare in Balarampur.

In Purulia district, forest and sub-forest dwellers having only limited areas for cultivation, meagre irrigated land and limited scope of irrigation system mainly depends on rainfall agriculture and the forest for their livelihood. Among small scale industries, the lac industry is another major source of income of this district. Purulia produces 90% of the lac produced in West Bengal. In this district here mainly two types lac produced Rangeeni & Kusumi crop. Lac cultivation generates employment, particularly in the off-agriculture season in Purulia.

The issues related to Lac cultivation and marketing in India have been examined by several studies. For example Pal et.al. (2009) examined Lac cultivation as a risk coping strategy for agriculture in Jharkhand. Pal et.al. (2013) studied the Socio Economics Status of Lac growres in Korba District of Chhattisgarh. Mandal and Sarkhel (2014) deals with the issues of cost of Lac Cultivaton and its profitability for two strains of lac crop Kusumi and Rangeeni in Purulia District. There are other studies on lac cultivation as well. However, to our knowledge there is no such work done towards examining the households' dependency on lac cultivation in the Purulia district. In this context the study will try to examine the dependency on Lac cultivation of households in the Karmadi village of Purulia district, West Bengal. The main objectives of the study are to find out the contribution of the Lac cultivation in households earning and to determine the factors responsible for the variation in this contribution across the Lac cultivating households

2. Profile of Study Area

Karmadi village is located in Jhalda-I block of Puruliya district in West Bengal. It is situated 16.2 km away from sub-district headquarter Jhalda and 61km away from district headquarter Purulia. Ilu Jargo is the gram panchayat of Karmadi village.The total geographical area of village is 101.98 hectares. Karmadi has a total population of 959 peoples. The Karmadi village has population of 959 (with 215 households) of which 473 are males while 486 are females as per Population Census 2011. In Karmadi village population of children with age 0-6 is 109 which make up 11.37 % of total population of village. In 2011, literacy rate of Karmadi village was 69.76 % compared to 76.26 % of West Bengal.

3. Data description

The study is based on a household survey conducted in Karmadi village, Purulia district during the months of March-April 2017. Most of the households in this village earn their livelihood from agriculture activities and selling physical labour. We have randomly collected data from 132 households using a structured questionnaire. It consists of questions on the basic information of the respondents such as household size, education, certain household characteristics, main source of livelihood, annual earnings from Lac, volume of land possession of (Lac insect's) host trees, distance between home to market, types of marketing, their annual family income from all sources etc.

Agriculture is the main source of livelihood for nearly 90% of the respondents. The average monthly income of the sample households is around Rs 3500. 80 per cent of the sample households belong to poor family in accordance to having BPL card at the time of survey. Almost all (90%) of the households in our sample reside in house made by mud and non-concrete material. Only 9 per cent of the sample resides in house made by semi-concrete material & only 1% house made with concrete material. 78 per cent of them have the access to improved sanitation, 94 per cent Household have electricity connection and 91 percent have access to Mobile phone.

In the Karmadi village mainly Kusum, Ber and Palas are the host tress available. The households of the village use to sell the sticklac in the three markets: Kalimati, Jargo and Jhalda (main bazar). The approximate distances of these three markets from the Karmadi village are 4 km, 6 km and 12 km respectively. It was reported during the survey that a number of households use to sell in more than one market simultaneously. Thus median of the set of possible average distances is considered as the critical distance which is 6 km. Kalimati and Jargo are the village markets while Jhalda (main bazaar) is the town market. They adopt both the direct and indirect selling marketing and sometimes rely on the both (direct and indirect) simultaneously.

The variables used in the Econometric analysis of the present study are given in the table 1.

Table 1: Variables Used in the Econometric-Analysis

Variable	Description	Specification
LACERNG	Annual Income from Lac	
GERNG	Annual earnings (from all sources) of household	
VLAND	Volume of land possession of (Lac insect's) host trees	
DST	Distance between home to market	1 if >6km, 0 otherwise
MRK	Type of market where product is sold	0 if village, 0 if town
MRKTN	Mode of marketing	0 if one type , 1 if both types
TWF	Total working members in Lac cultivation	

4. Econometric Models

To examine the dependence of the households on the Lac cultivation the study developed three separate models based on the following two questions:

1) How far does the total income (gross earnings from all sources) be responsive to the earnings from Lac cultivation? (Model 1).
2) Analyse the factors responsible for the variation in the Lac's contribution (earning from lac cultivation) in the total income across the households (Model 2 and Model 3)?

The answer of the question-1 will help to understand the impact of Lac cultivation on households' gross earnings. Lac farming provides subsidiary income to the (lac) cultivating households. However, this extent varies across the households. In this context the question-2 will help to find out the contribution of the lac cultivation in households' gross earning and the factors responsible for the variation in this contribution across the households in the Karmadi village of Purulia district, West Bengal.

Model 1

To answer the first question the study used a double-log regression equation:
$$ln(GERNG) = a + bln(LACERNG) + u \quad (1)$$

The OLS regression method was used and the estimated slope coefficient, (b) measurers the elasticity of *GERNG* with respect to *LACERNG*, that is the percentage change in *GERNG* for a small percentage change in *LACERN*.

Model 2

It analyses the factors responsible for the variation in the Lac's contribution in the total income across the households the following regression model is used:

$$PLACERNG = \beta_0 + \beta_1 VLAND + \beta_2 DST + \beta_3 MRK + \beta_4 MRKTN + \beta_5 TWF + v \quad (2)$$

Where,

$$PLACERNG = \frac{LACERNG}{GERNG} \times 100$$

The OLS regression method is used to find out the individual slope coefficients.

Model 3

From the data set it is evident the proportion of earnings from Lac cultivation to the gross earnings (*PLACERNG*) varies from 10 percent to around 57 percent. It will be interesting to find out, for a household, the factors responsible for *PLACERNG* to exceed a certain threshold level. The data reveals, for the 57 households out of 132 households, earnings from Lac cultivation constitute more than 34 percent of their gross earnings. Following this the

present study assumes the threshold level as 34 percent (average of 10% and 57% in approximate terms). Hence, a new variable y is defined as

$$y = \begin{cases} 1, & PLACERNG > 34 \\ 0, & PLACERNG \leq 34 \end{cases}$$

The logistic regression model is applied to analyse this issue. Based on the logistic cumulative distribution function, the probability of a household having an earning from Lac cultivation constituting more than 34 percent of gross earnings is:

$$p = Pr(y = 1) = \frac{exp(X_i'\beta)}{1 + exp(X_i'\beta)}$$

Where, X_i is a set of predetermined variables and β is the set of parameters to be estimated. After the logit transformation,

$$ln\left(\frac{P}{1-P}\right) = X_i'\beta \quad (3)$$

5. Results and Econometric Analysis

The regression result of the model 1 is summarised below in table 2:

Table-2: Elasticity of Gross earnings with respect to earnings from Lac cultivation

Dependant variable- $ln(GERNG)$	Coefficients	t	p
Intercept	8.644	27.936	0.000
ln(LACERNG)	1.002	7.176	0.000
r-square			0.685
Total Observations			132

As result shows, the elasticity of *GERNG* with respect to *LACERNG* is about 1.002, suggesting that if the earning from Lac goes up by 1 percent, on average, the gross earnings goes up by more than 1 percent. Thus, the gross earning is moderately responsive (moderately elastic) to changes in earnings from Lac cultivation.

The regression result of the model 2 is summarised below in table 3:

Table-3: Factors determining the variation in the contribution from Lac cultivation

Dependant variable - $PLACERNG$	Coefficients	t	p
Intercept	19.6973	4.7242	0.0000
VLAND	4.6436	7.3807	0.0000
DST	2.5127	1.0869	0.2812
MRK	0.5660	0.2646	0.7922

MRKTN	0.7555	0.7358	0.4646
TWF	2.1809	5.7682	0.0025
Multiple R^2	0.7871		
Adjusted R^2	0.7617		
Total Observation	132		

From the regression result (Table 3) it is evident Volume of land possession of host trees and the total working members involved in Lac cultivation are the most important factors determining the variation in proportional Lac earning for the sample households. As *VLAND* goes up by 1 unit, keeping all the other variables constant, *PLACERNG* goes up more than 4.5 times and with the increase in 1 unit of *TWF*, *PLACERNG* on an average increases by more than 2 units, keeping all the other variables constant. The goodness of the model is good.

The regression result of the model 3 is summarised below in table4:

Table 4: Logit Regression results

Dependent Variable - y	Odds Ratio	Coefficient.	$p > |z|$
VLAND	2.949	1.0814	0.0121
DST	1.296	0.2592	0.5133
MRK	1.099	0.0944	0.6736
MRKTN	1.004	0.0039	0.5431
TWF	2.672	0.9828	0.0162
constant		8.9025	0.0087
No. of observation	132		
Prob>chi2	0.0005		
Pseudo R2	0.0702		

The model 3 is estimated by maximum likelihood. Econometric results feature 'odds ratios' that are associated with each explanatory variable. The 'odds ratio' indicates how often the event happens, relative to how often it does not, under a certain circumstance.

Results in Table 4 shows that variables *VLAND* and *TWF* are mainly associated with the case that *PLACERNG* exceeds 34 i.e. the earnings from Lac cultivation constitute more than 34 percent of gross earnings. Households that are having much land possession of host trees (higher *VLAND* value) are around 3 times more likely to have earnings from Lac which constitutes more than 34 percent of gross earnings. With other variables remaining constant, if volume of land possession of host trees increases by a unit; on average the estimated logit

increases by around 1.08 units. The relationship between these two is positive and significant. Similarly households that are having higher total working members in Lac cultivation are more than 2.5 times more likely to have earnings from Lac which constitutes more than 34 percent of gross earnings. With other variables remain constant, if total working members in Lac cultivation increases by a unit; on average the estimated logit increases by nearly 1 unit. The other factors like distance from the market, market type and marketing type do not have (individual) statistically significant effect. These factors are not likely to associate with more than 34% contribution of Lac earnings in the gross earnings for the sample households.

6. Conclusion

Lac encrusted twigs is regarded as Non Wood Forest Product (NWFP) of great economic importance. Lac farming provides subsidiary income to the cultivating households. In this context the present study examines the dependency of the lac cultivating households on the earnings from the lac cultivation. The study also tried to determine the factors responsible for the variation in the relative contribution of lac cultivation across the Lac cultivating households. For this purpose, we have conducted a household survey in the Karmadi village of Purulia district. We found that gross earning is moderately responsive to changes in the earnings from the Lac cultivation. Among the factors volume of land under host trees and the total working members involved in Lac cultivation are found to be the most significant in determining the variation in the relative contribution of income from lac cultivation to the total income of the households.

Refernces

Chattapadhyay, Sailesh (2011): 'Introduction to Lac and Lac culture', Department of Forest Biology & Tree Improvement Faculty of Forestry Birsa Agricultural University, Kanke, Ranchi, Jharkhand.

District census handbook Purulia (2011) PART XII-A & Part XII B, Directorate Of Census Operations ,West Bengal

Govind Pal, et.al (2009): 'Lac cultivation as a risk-coping strategy for Agriculture in Jharkhand', Indian Lac Research Institute, Ranchi (Jharkhand).

Govind Pal, et.al (2014): - Socio-economic status of *Lac* growers in Korba District of Chhattisgarh, Directorate of Seed Research (I.C.A.R.), Kushmaur, MAU (U.P.) INDIA

Lac, Plant Resins and Gums Statistics 2016 : At a Glance (2018), ICAR-Indian Institute of Natural Resins and Gums, Namkum, Ranchi

Mandal J, and J. Sarkhel (2014): Cost of Lac Cultivation and Its Profitability in Purulia District- A Case Study, Business Spectrum, Vol. IV No.1

Pal Govind, N. Prasad, S. Ghosal, S.K. Pandey And M. Kumar (2013) - Socio-economic

Profile of lac growers in Ranchi and Khunti District of Jharkhand, *Indian Institute of Natural Resins and Gums (ICAR), Ranchi – 834010, Jharkhand.*

Pal, Govind (2009): 'Impact of Scientific Lac Cultivation Training on Lac Economy   – A Study in Jharkhand, Transfer of Technology Division, Indian Institute of Natural Resins and Gums' (ICAR) Ranchi, Jharkhand.