

The Role of Joint Forest Management Committee in Poverty Alleviation: A Case Study on Tripura State, India

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Abstract

In India, Joint Forest Management (JFM) is one of the recognized organizational systems to regenerate forest resources, meeting local needs of people and sharing expected benefits. This study examines the factors that affect success of JFM program by testing the hypothesis that JFM committees' activities play a major role in poverty alleviation in North and South Districts of Tripura. The study hypothesis has been analyzed through Multiple Regression, Probit and Logit models, based on information obtained from primary survey of 200 households. In South District, expenditure pattern indicates that non-JFM households' expenditure is high on non-productive activities whereas that of JFM households' is more on productive activities. Income and asset possession of JFM households is high as compared to non-JFM households. In North District, income of non-JFM households is higher than JFM households, but their expenditure is very high on both productive and non-productive activities in comparison to JFM households' expenditure. These expenditure patterns indicate some finer points about their socio-economic condition which are later discussed in the paper. In short, South District JFM households contribute significantly to their socio-economic conditions compared to North District JFM households. North District JFM households' contribution to their socio-economic condition is less, because of lack of awareness arising from limited interactions of households with the Forest Department officials. The overall study concludes that the effective functioning of JFM committees is critical towards reducing poverty in the region, as evident from the comparative study of South and North Districts.

Key Words: Join Forest Management, Multiple Regression, Probit Model, Logit Model, Productive Expenditure and Non-Productive Expenditure

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I. Introduction

In India, Joint Forest Management (JFM) is one of the recognized organizational systems to regenerate forest resources, meeting local needs of people and sharing expected benefits. In order to conserve, regenerate and enrich forest resource base as well as to reduce the dependency of forest dwellers and people residing on the fringes of forest, the Government of Tripura passed its own resolution¹ to establish an organization called Joint Forest Management Committee (JFMC). The main objective of this study is to examine the role of JFMC in poverty alleviation in Tripura State. The study attempts to analyze the trends of the productive and non productive expenditure incurred by JFM committee members as well as non-JFM committee members in Tripura State. In Tripura, more than 70 percent of the total population is engaged in agriculture and allied activities like animal husbandry, forestry, and fishery. It contributes about 43 percent of the net state domestic product². However high density of population coupled with high growth rate and rapidly declining landholding, has led to decline in the productivity of agriculture. Furthermore, lack of non renewable resources coupled with inadequate infrastructure has created hurdles in the path of growth and development of the state. There has been hardly any significant development in the industrial sector. As a result, the local population is increasingly becoming more dependent on forests to supplement their income. Also, it is a paradox that where more forests exist, there is higher degree of poverty and to mitigate this problem several policy initiatives have been tried but still much is required to be done (Singh, 2003). Several questions arise concerning implementation of JFM on a sustained basis. So it becomes necessary to study the role of JFMC in Tripura State. There has been continuous non sustainable usage of the forest. The problem had been grimmer some years earlier due to customary rights and concessions exercised by the people of Tripura. The major area of the state is highland covered with green cover. About 60 percent of the total area is covered with forest cover and only 20 percent of the total area is arable land³.

The key hypothesis considered here is that the socio-economic condition of JFM Committee members is better than that of non-JFM committee members. The paper

¹ No.F.17 (140)/For-Dev/90-91/47030-529 on 20th December, 1991

² State Economic Review (2005)

³ State Economic Review (2005)

considers the income distribution of poor and richer people to evaluate their participation in JFM meeting as well as it evaluates their expenditure on productive and non-productive activities. It identifies the impacts of being a JFM committee member on their socio-economic condition. Finally, it assesses the factors which could influence them to participate in JFM meeting. The study suggests some valuable policy inputs to execute the JFM institutional framework more efficiently. It concludes that the socio-economic condition of people associated with JFMC in South district has improved than North district. The paper has been divided into four parts – part one begins with the review of literature. Part two highlights the characteristics of the study area, data collection and descriptive statistics of the variables. Part three highlights the econometric model adopted to test the hypothesis and finally part four provides results with strong policy implications based on the findings of the study.

II. Literature Review

There are several studies on the role of JFMC in different parts of the world. The study conducted by Kumar (2002) at Jharkhand concludes that JFM is well suited to the promotion of sustainable forest regeneration, but such regeneration has been achieved at the expense of the poor. In the absence of significant levels of inter-group mobility and thus of reduction in the level of inequality between poor and non poor villagers, it is imperative that actions should be taken to put in place compensatory mechanisms for rural poor in order to secure a proper measure of equity. The present study considers the inequality through incorporating the variables namely income from agriculture and allied activities, income from forestry, income from livestock etc. Adhikari *et al* (2003) concludes poor households face more restricted access to community forest resources than less poor or relatively better off households. Their analysis suggests that collection of forest products from community forest is dependent on various socio-economic variables. The variables like landholding, livestock, caste, education and households' economic status exert a strong influence on appropriating benefits from the commons. Adhikari (2005) in his study on Nepal's common forestry found that income from common forestry resources is related to socio-economic attributes and private endowment of households. The households with land and livestock assets and also belonging to upper caste gain more income from commons forestry resources. Thus the less poor households are, in absolute terms, more dependent but in relative terms, less dependent on forest resources than the poor. Also, the female-headed households benefit less from common forests, thus, further aggravating the inequity in distribution of benefits. The present study

considers the income distribution of poor and richer people to evaluate their participation in JFM meeting as well as it evaluates their expenditure on productive and non-productive activities. Behera (2006) states that community elites continue to dominate actual decision-making process despite efforts by policy makers to empower poor and weaker section people in JFM area. The present study considers these issues through richer and poorer people's participating in the JFM meeting. It identifies the factors which could influence their decision to participate in the JFM committee's meetings. According to Bandyopadhyay *et al* (2004) village proximity to forest, leadership and fuelwood dependence are significant factors in influencing their participation in common forestry. It has been found that participating households consume more fuelwood than non-participant households. Their analysis reflects that fuelwood consumption is closely tied to fuelwood collection and decrease with increase in assets. The present study also includes household fuelwood collection to assess the participation of households in the JFM meeting. It also includes education as one of variables which could influence their participation in the JFM committee meeting. Lise (2000) concludes that a high dependence on the forest and good forest quality enhances voluntary people's participation. Low average level of education in family and high levels of education of respondents and greater involvement of women in the community stimulates participation. In addition, state has a major role in stimulating the people's participation. The present study explains gender related issues through inclusion of gender variable in the econometric model. Dhanagare (2000) highlighted the weakness in the institution and lack of clarity about the sharing of usufructs among beneficiaries and between forest department and the people. The author stressed on the partnership between forest department and the people for the success of JFM.

III. Details of the Primary Survey

The profile of study area

The study focuses on the South Tripura and North Tripura where the forest department functions through two circles – northern circle and the southern circle. Out of the total 6292.68 sq. km. of Government Forests in the state, 3093.96 sq. km. lies in the northern circle and 3198.72 sq. km lies in southern circle. The forests in the South Tripura District are administered through three territorial divisions, namely Udaipur, Bagafa, Gumti and one Wildlife Sanctuary at Trishna. The Conservator of Forests based at Udaipur monitors the activities of the Divisional Forest Officers (DFOs)/ Wildlife Warden in South Tripura district and West Tripura district. In South Tripura, 182 JFMC/EDCs are functioning covering a project area of 36054 ha

including 17527 hectares of land covered under plantation. The total membership of JFMC/EDCs in the district is 12045. The community wise classifications show that 54.29% are STs, 22.48% are SCs, 14.61% are from general category which mainly includes the upper caste groups and remaining 8.62% are people belonging to OBC group. The study has chosen Simsima as a main study area in South Tripura. Simsima is a panchayat village located in development block of Matabari, Tehsil Gorjee. The village falls in the circle of district South Tripura. The village has a JFMC named 'Azad Hind Baanaayan Committee'. The effort to form this committee was initiated in 1996 but it was only in 2002 that the committee was recognized by the forest department. The memorandum of understanding (MoU) was signed between the forest department and the committee on 11th July, 2003. During the initial days the people were hostile to the view of formation of committee as it viewed the committee as an agent of government to prevent them from cutting trees for fuelwood. However, the JFMC was formed and gradually the objectives of the committee were brought to the notice of the community through organizing awareness campaign with the assistance of forest department. This formed the motivation for choosing Udaipur in South Tripura as a study area. In Appendix A, Figure 1 gives the general location of the South Tripura. The close relationship between the people and forest; the philosophy of 'protect and prosper' brought the people especially tribals closer to JFMC. The tribal 'Garo community' also started to participate in the affairs of the JFMC. However, there is no representation of tribals in the executive committee. There are seven members in the executive committee; the executive committee is dominated by the members of the OBC community. There is only one woman in the executive committee as against the two (33%) required mandatory according to the guidelines. There is no ST member in the executive committee. All the members of the executive committee are educated. The annual membership fee of the committee was Rs.20/- only. The committee has opened a joint account in the Grameen Bank, Chanderpur, which is operated jointly by the Member secretary and the treasurer of the committee. Because of these issues, the study includes the variable like social groups and savings of households. The practice of shifting cultivation (*jhuming*) has reduced with the formation of the JFMC. The members of the committee are vigilant about the illicit felling of the trees and the offender is caught and is handed over to the forest department. In primary study, 62 percent respondents are members of the JFMC in South Tripura. The general body meeting is held once in year in the month of March-April. However no general body meeting was conducted in the 2006-2007. Initially during 2002 the JFMC was provided with the land of 80 hectare, in 2005 it was further provided with

120 hectare land. It now has 200 hectare land. The JFMC has taken over plantation of hybrid *Amla* and Bamboo, the benefits of which shall be obtained after ten years. The wage employment for the members of JFMC is meager, only two days employment was provided last year to the members during the seed sowing of hybrid *Amla* and Bamboo. The wage employment is insufficient as there is no vacant land in the forest area belonging to JFMC. This motivated us to explore the income generation from the forest activities. The vital issue in the village is the prevalence of poverty and economic insecurity which forces people to work hard and for long hours in the fields. About 40% families are either land less or do not have sufficient resources to take up farming on their own land. The fact that people are always engaged in economic activities for meeting their daily needs leaves little time for them to participate in the activities like JFMC. The JFMC has been obtaining funds from the forest department for investing in the income generation activities of the members. The fund flow to the JFMC is not regular which acts as bottleneck in the planning activities. Finally, it further motivated us to analyze the income from the agriculture, horticulture and livestock.

The forests in the North Tripura district are administered through four territorial divisions, namely Kanchanpur, North, Manu, and Ambassa. The Conservator of Forests based at Kumarghat monitors the activities of the Divisional Forest Officers (DFOs). Chinibagan is the para located in Deoracherra. Deoracherra is an Autonomous District Council (ADC) village that falls in the development block and tehsil of Gaur nagar in Kailasahar sub-division of district North Tripura. The village has a JFMC named "Briksha Mitra". The MoU of the committee was signed in July 2002. The committee is not registered with the forest department. Majority of people inhabiting the project area live below poverty line and work as casual labour. In addition to that the other economic activities prevalent in the project area are collection of minor forest produce such as bamboo, thatch, firewood etc. The project area has mixed community comprising of Hindus, Muslims and Christian. The committee now has a land of 350 hectares available for plantation and other NTFP activities.

IV. Data Sources

The required data for the study was obtained through a primary survey of 200 households using detailed face-to-face questionnaire/ interview schedule and secondary data. The survey was done in two phases. Firstly, a pre-pilot survey was done. In this, the areas were visited initially and the problems were analyzed. After the pre-pilot survey, two districts were selected namely North Tripura and South

Tripura representing and supporting the objective of the study. From each district one representative village was selected namely Chinibagan in North Tripura and Simsima in South Tripura districts, based on the purpose of the study. The target villages were selected on the following criteria, accessibility from road, having more than 250 households, degraded forest (crown density below 40%), dependency on forest resources for livelihood, presence of JFMC. Before conducting the main survey a pre-testing of the interview schedule was done at village Tulakona in West Tripura. The questionnaire was tested on 10 households and was finally modified accordingly. The main household survey was conducted for 10 days with the assistance of ten enumerators having sociology background consisting of 6 boys and 4 girls, fluent in Kokborok, Bengali, Hindi and English languages. The data was collected from 100 households selected randomly in each village on their demographic details, socio-economic condition (level of education, social group, income from different sources, land and assets holding), their expenditure pattern, their dependency on forest and lastly about their awareness of JFM and its benefits.

V. Details About Questionnaire

The surveyed questionnaire contains a brief introduction about the study and is divided into seven sections. The first section covers basic information about the villages (name, gram shabha, block, sub-division, and district) and the respondents (name, age, social group, religion, gender, education, main occupation and supplementary occupation). The second section covers socioeconomic data of the family (age structure, family composition, level of education, occupation etc). The third section contains the detailed information about the annual income (income from agriculture and allied activities- crops, horticulture, livestock, forestry products and income from non agriculture and allied activities), yearly expenditure (productive and non productive expenditure) and savings. The fourth section covers details on assets ownership (land holding, livestock possession, housing specifications-size and type, household assets, agriculture assets, vehicles possession etc). Section five gets information on the households' dependency on the forest for fodder, fuelwood and other non-timber forest products and section six contains information on JFM (participation of people in the JFM committee meetings, people's perception about the JFM committee's work plans, types of benefits derived, etc). The last section covers details on the perception about the shifting (*jhuming*) cultivation. The questionnaire was prepared in two languages English and Bengali.

VI. Socio-economic Characteristics and Attitudinal Questions of the Surveyed Population

Table 1 presents the descriptive statistics of socio-economic characteristics and attitudinal questions of the surveyed population. Out of the 200 observations collected in two villages, 89.5% respondents are males and the remaining 10.5% are female respondents. Both the villages are mainly inhabited by groups considered to be lower in the social ladder namely SC/ST and OBC. In the village Simsima, OBC is the dominant group followed by SC/ST. Out of 100 observations collected, about 55% respondents are OBC and 45% are SC/ST. Whereas in Chinibagan, the percentage of SC/ST population is very high. About 87% respondent belongs to SC/ST social group. The respondents are mainly in productive age with mean age of 44 years in Simsima and 39 years in Chinibagan. The survey findings highlights that the literacy level is high in both the villages. Out of 200 respondents, 58% respondents are found to be literate. Majority of the respondents have studied up to secondary level. However, the level of literacy is better in Simsima in comparison to Chinibagan. The figures indicate that people of this village have inclination for higher studies. In Simsima, 9% respondents have done their graduation where as there is none in Chinibagan.

The surveyed villages found to have an agrarian economy. The main economic activity is agriculture and allied activities. Around 55% respondents own land in Simsima and the average land holding size is 2.069 kanis⁴ (equal to 0.33 hectares). Whereas in the other village, around 46% respondents own land and the average land holding size is 1.624 kanis (equal to 0.26 hectares). Since rice is the staple diet of the people of Tripura, the majority of the respondents cultivate paddy. The production of rice is more in Simsima than Chinibagan because of presence of fertile plain land and better soil composition suited for the paddy. However the topography of Chinibagan is well suitable for horticulture crops. The mean income earned by people of this village from horticulture crops is Rs. 1641.25 per annum, which is higher than what is earned by people of Simsima, who earns about Rs. 445 per annum on an average. However, the mean of annual incomes from various sources points out that majority of people are living at subsistence level. The annual mean income of the people in Simsima and Chinibagan is Rs. 13353.2 and Rs.12282.3 respectively.

The asset ownership also point towards the poor economic condition of the people. The statistics reveals that in village Simsima, 34% have radio, 21% have TV, followed by 16% families having fan. The percentage of respondents owning LPG

⁴ 1 hectare = 6.25 kanis

and refrigerator is only 4% and 1% respectively. Though majority of the respondents are associated with agricultural activities, the possession of agricultural tools is dismal. Just 15% households own plough, 2% have tillers. About 7% households have water pumps and there is just one family that has a tractor. The maximum number of respondents own bicycle. Around 32% households have bicycle, 2 % families have car.

The asset holding of households of Chinibagan is worse than Simsima's household asset holding. The statistics of village Chinibagan reveals that 26% have radio, 11% have fan, followed by 10% families holding TV. The percentage of respondents owning LPG and refrigerator is mere 1% each. Despite the fact that a good number of respondents are associated with agricultural activities, the possession of agricultural tools is although the more dismal. Just 13% households own plough. There is just one family that has tractor and no family acquires tillers and water pumps. Around 10% households have bicycle, 1 % family each has car, motorcycle and auto rickshaw.

The pattern of fuel consumption in both the villages indicates that household use mainly fuelwood as cooking fuel. The average annual consumption per household of fuel wood in Simsima is less than the consumption by household of Chinibagan, which is 1391 kilogram, and 2351.4 kilogram respectively. The other fuels used are dung cake and kerosene. The annual average consumption per household of dung cake and kerosene in Simsima is 61.92 kilogram and 63.69 liters respectively. While in Chinibagan, the annual average consumption per household of dung and kerosene is 102.72 kilogram and 46.38 liters respectively. The usage of LPG as cooking fuel is gradually rising in Simsima.

The forest plays a crucial role in the life of people of Tripura. The households in general are dependent on forest for both timber and non-timber forest produce like fodder, firewood, fruits, bamboo and other minor non-timber forest produce. The statistics on the dependency of people on the forest indicates that 21% households in Simsima and 26% households in Chinibagan are completely dependent on forest for fodder for their cattle. The figures indicate that in Simsima, 62% respondents are member of JFMC and about 60% member respondents have attended committee's meeting at most once. The members along with forest officials are taking active part in the preparation of micro plan. Around 37% member respondents have participated in the preparation of micro plan for their JFM committee and its members. The reviews of members about the activities of their JFMC are very encouraging. 60% members have been benefited from the activities undertaken by the JFMC. Whereas in Chinibagan, so far only 41% respondent have taken JFMC's membership.

Moreover close to 60% member respondents have not attended the JFMC meeting even once, even to know about the objective and activities of JFMC. The level of people's participation in micro plan formulation is very disheartening. Just 2% members have taken part in micro plan formulation. In Simsima, 60% member respondents have been benefited from JFM Committee's activities. In comparison to Simsima figure, in Chinibagan only 40% feel benefited from the activities undertaken by this committee and the remaining 60% felt that such committee's are not at all beneficial. This is the principal reason for their minimal involvement in JFMC activities.

The study further analyzes the issues of shifting cultivation (*jhum cultivation*); it is primitive form of agricultural practice that is well rooted in cultural ethos of the tribals. This practice is the major cause of deforestation, land degradation and soil impoverishment in Tripura. According to Forest Department records⁵, more than 55,000 tribal families are engaged in this destructive practice with very low and progressively declining output. It has been estimated that annually 350 to 400 sq. km. of forests is sacrificed to shifting cultivation. To conserve and enrich the degraded forest cover, systematic efforts are being made by forest department. They are running several schemes for in-situ rehabilitation of these tribal along with rehabilitation of degraded forests. The recent statistics on shifting cultivation indicate towards the decline in number of families undertaking shifting cultivation. For example, in Chinibagan, according to Agriculture Department (Govt of Tripura, 2005) over the last five years, there has been significant decline in both the number of household practicing and the area under shifting cultivation. The numbers of such households have reduced from 280 in the year 2000 to 85 in 2005. The area under it has shrunk from 310 hectares to 210 hectares during this time span. The results of the surveyed villages show mixed perception of people about shifting cultivation. Out of 200 respondents, 21% respondents hold positive views about it. In their view, shifting cultivation is more productive as it produces more yields at less cost. Besides, they find this form of cultivation to be more convenient to carry out. Where as, around 18.5% respondent considers it to be bad. According to them, it is highly labor intensive and generates low output. Furthermore, it leads to depletion of natural resources in general and forests in particular. However, the majority of the respondents does not have any clue about the merits and de-merits of shifting cultivation since they have never practiced this before.

⁵ A Compendium of Forests and Forestry in Tripura, 2000

However, the observation in the field visit and the interaction with the forest officials highlights the fact that shifting cultivation is not merely a form of cultivation but is in fact a way of life of tribal community. The efforts can be taken to reduce the number of families engaged in it by encouraging them to adopt other forms of farming but a complete metamorphosis is impractical and unimaginable.

VII. The Model

The first hypothesis of the study is that, the JFMC members' productive expenditure is higher than the non-JFMC members. For estimating the impacts of being a JFMC member on their productive expenditure, economists have over the years developed several techniques to value them. The study has been carried out based on two multiple regression models. These two models evaluate the expenditure on productive and non productive activities of JFMC and non-JFMC members. It further analyzes the JFMC members' productive and non productive expenditure in both South and North Tripura districts through interaction effect between JFM memberships and district dummy.

$$\text{Prod_exp}_i = f(X_i, \text{JFM_district}), \quad i = 1, 2, \dots, n. \quad (1)$$

$$\text{Non-Prod_exp}_i = f(X_i, \text{JFM_district}), \quad i = 1, 2, \dots, n. \quad (2)$$

Here we use two models for assessing the determinants of productive and non-productive expenditure based on socio-economic characteristics. In the first model (1) the dependent variable is productive expenditure (Prod_exp_i). It includes expenditure on food, transportation, electricity, education, fodder collection, fuel, cost of cultivation, vehicle maintenance cost. In the second model (2) the dependent variable is non-productive expenditure (Non-Prod_exp_i). It includes ceremonies, festivals, marriage and alcohol & tobacco. Basically productive expenditure leads to improvement in the productivity of economic activities under taken by people and helps in elevating their socio-economic condition. Whereas the non-productive expenditure sluggish the momentum and productivity of economic activities undertaken by people.

The independent variable X_i describes the socioeconomic characteristics (income, wealth (assets), education and etc), JFM membership, JFM attendance, district dummy etc. JFM_district denote interaction effect between JFM membership and District dummy for a household.

Finally, the objective of the study is to assess the determinants of households' socio-economic characteristics in explaining attendance in the JFM meeting. This

objective has been estimated through (i) Probit model altered by Hausman and Wise (1978) and formalized by Maddala (1999) and (ii) Logit Model. In principle one could substitute the logistic CDF in place of the normal CDF, so the study has adopted both probit model and logit model. Amemiya (1981) suggests that whenever a logit estimate of a parameter is multiplied by 0.625 gives a fairly good approximation of the probit estimate of the same parameter⁶.

(i). Probit Model

The probability of household participation in the JFM meeting depends on several socioeconomic and behavioral characteristics, which can be modeled as:

$$Y_i = f(Q_i), \quad i = 1, 2, \dots, n. \quad (3)$$

Here Y_i is the probability of household participation in the JFM meeting.

The independent variable Q_i = socio-economic characteristics, income, wealth (assets), education, district dummy etc. The econometric specification of the model can be written as follows:

$$Y_i^* = a + bQ_i + u_i \quad (4)$$

$i = 1, 2, 3, \dots, n$ (i^{th} household)

$$E(u_i) = 0, \text{ Var}(u_i) = \sigma^2$$

In practice, Y_i^* is unobservable. What we observe is a dummy variable Y defined by

$$Y = 1 \text{ if } Y_i^* > 0 \quad (5)$$

$$Y = 0 \quad \text{Otherwise}$$

In this formulation, bQ_i is not $E(Y_i/Q_i)$ as in the linear probability model, it is $E(Y_i^*/Q_i)$.

From the relations (3) and (4)

We get $\text{Prob}(Y_i=1) = \text{Prob}(u_i > -bQ_i)$

$$= 1 - F(-bQ_i) \quad (6)$$

Where, F is the cumulative distribution function for u_i . In this case the observed values of Y are just realizations of a binomial process with probabilities given by (6) and varying from trial to trial (depending on Q_i). Hence, the likelihood function is

⁶ T. Amemiya, "Qualitative Response Model: A Survey", Journal of Economic Literature, Vol. 19, pp. 481-536.

$$L = \prod_{yi=0} F(= -bQi) \prod_{yi=1} [1 - F(-bQi)] \quad (7)$$

The functional form for F in (7) will depend on the assumptions made about u_i in (4). In our model, we assume that u_i are $IN(0, \sigma)$. In this case

$$\int_{-\alpha}^{-bQi/\sigma} 1/(2\pi)^{1/2} \exp(-t^2/2) dt \quad (8)$$

It can be easily seen from (8) and the likelihood function (7) that we can estimate only b/σ , and not b and σ separately.

(ii) Estimation of Probit Model

The dependent variable in Probit model is households' participation in the JFM meeting. The independent variables include socio-economic factors, wealth (assets), and income from agriculture, income from horticulture, and income from livestock.

As is typical of any cross-sectional survey, there is a chance to get heteroscedasticity in the model, which has to be reduced by using log-transformation and weights. If there is any multicollinearity among independent variables then the study has to drop some of the variables which have high multicollinearity. The coefficients of the probit model cannot be interpreted directly as in linear models. Here the slope coefficient measures directly the change in the probability of an event occurring as the result of a unit change in the value of a regressor, with the effect of all other variables held constant at their mean value.

To obtain the marginal effects of the probability of household participation in the JFM meeting, we have to take derivatives of this function with respect to Q_i . It turns out that this derivative is:

$$dY_{ij}^*/dQ_i = f(a+bQ_i)b_i \quad (9)$$

(iii). Logit Model

The study also adopts logistic function to test the hypothesis. The following section describes briefly about model specification:

$$P_i = E(Y= 1/R_i) = \alpha + \beta R_i \quad (10)$$

Where independent variable R_i = socioeconomic characteristics, income, wealth (assets), education, district dummy etc. Dependent variable $Y = 1$ indicates

household participation in the JFM meeting. But now consider the following representation of participation in JFM meeting,

$$P_i = E(Y = 1/R_i) = 1 / 1 + e^{-(\alpha + \beta R_i)} \quad (11)$$

For ease of exposition, we write (11) as

$$P_i = 1 / 1 + e^{-Z_i} \quad (12)$$

Where $Z_i = \alpha + \beta R_i$

Equation (12) represents what is known as the (cumulative) logistic distribution function. It is easy to verify that as Z_i ranges from $-\alpha$ to $+\alpha$, P_i ranges between 0 and 1. P_i is non linearly related to Z_i (i.e., R_i), thus satisfying the two requirements namely, $Z_i \rightarrow +\alpha$, e^{-Z_i} tends to zero and $Z_i \rightarrow -\alpha$, e^{-Z_i} increases indefinitely. But it seems that in satisfying these requirements, we have created an estimation problem because P_i is nonlinear not only in R but also in the β 's as can be seen clearly from (11). This means that we cannot use the familiar OLS procedure to estimate the parameters. If P_i , the probability of household participation in JFM meeting is given by (12), then $(1-P_i)$, the probability of not participating in the JFM meeting is

$$1-P_i = 1 / 1 + e^{Z_i} \quad (13)$$

Therefore, we can write,

$$P_i / 1-P_i = (1/1 + e^{-Z_i}) / 1 + e^{Z_i} = e^{Z_i} \quad (14)$$

Now $(P_i / 1-P_i)$ is simply the odds ratio in favor of household participation in JFM meeting. It is nothing but, the ratio of the probability that a household will participate in JFM to the probability that it will not participate in JFM meeting. Now if we take the natural log of (14), we obtain very interesting results, namely

$$L_i = \ln(P_i / 1-P_i) = Z_i = \alpha + \beta R_i \quad (15)$$

That is L_i , the log of that odds ratio is not only linear in R , but also linear in the parameters.

(iv). Estimation of the logit Model:

For estimation purpose,

$$L_i = \ln(P_i/1-P_i) = \alpha + \beta R_i + u_i \quad (16)$$

The interpretation of the logit model is the slope coefficients β which measures the changes in L for a unit change in R , i.e., it tells how the log-odds is favoring participation in JFMC meeting when socio-economic characteristics and other explanatory variables change by a unit. The intercept α is the value of the log-odds in favor of participation in the JFMC meeting if R_i equals to zero.

VIII. Results of the Study

The results as derived from the multiple regression indicate that education, land owned, JFMC membership, district dummy, interaction effect between JFMC and district, income from crops, and household assets are important determinants in explaining the impact of socio-economic characteristics on productive and non productive expenditure of the households. In model, the district dummy variable and JFM variable shows that there is negative impact on productive expenditure. District dummy indicates that the productive expenditure is very less in South Tripura as compared to North Tripura, but the important point to consider here is that, we don't know whether the person holds JFMC membership or not. In general, those who are holding JFM membership spends less on productive expenditure, but the puzzle is that, whether the JFM member belongs to North or South Tripura district. So, these issues have been captured through interaction effects between JFMC membership and district variable. The result of the interaction effect highlights that a person being member of JFMC as well as resident of South Tripura, is spending more on productive expenditure, when all other independent variables are held constant. It shows the productive expenditure increases by 8802.97 units, if the person is holding JFMC membership as well as residing in South Tripura, when all other independents are held constant, which is highly significant at 1% level. Apart from this, education plays a critical role at 5% level, in determining the pattern of productive expenditure. For a unit increase in education the productive expenditure increases by 1605.92 units. The income from the crops and possession of household's assets have positive and significant impact on productive expenditure – it indicates as income from crops and households' assets increases by a unit, productive expenditure on an average increases by about 0.36 units and 2009.5 units respectively.

The wages earned from the forest shows positive and significant affiliation with productive expenditure. It means as the wages from the forest increases by a unit, the

productive expenditure on an average increases by 0.125 units. In sum, the reason behind higher spending by the JFMC members as compared to non-JFMC members in South Tripura on productive expenditure is attributed to the close interaction between forest officials and JFM members. It indicates the forest officials have been successful in spreading awareness about JFM objectives. The forest department is running many training programs to enhance the skill of the people in diverse fields like goatary, piggery, pesiculture, silviculture, handicraft etc. Moreover, forest department has taken up various forestry activities, viz, plantation of bamboos, creation of nurseries, construction of check dams, plantation of medicinal plants and forestry species. These activities are intended to enhance their income over the period. The local people are taking initiatives at personal level under the guidance of forest officials to enhance their source of livelihood also.

In the model, R-square value of productive expenditure is 0.28 which means that about 28 per cent of variation in the dependent variable is explained by independent variables. The overall fitness of this model can be estimated through F-value. The F-value shows the model has perfect fit to estimate the relationship between independent and dependent variables.

Regarding non productive expenditure, as indicated in Table 3, the interaction effect variable between JFMC and district has non significant negative coefficient. It indicates that South Tripura JFMC members' outflow on non productive expenditure is less as compared to North Tripura JFMC members. Further the study attempts to explore the expenditure pattern among social groups. The result indicates the expenditure incurred by SC/ST on non productive activities is not having significant impact, but the coefficient of the variable shows positive sign. It indicates SC/ST groups are socially and economically underprivileged. It leads them to spend less on productive expenditure. High age group people spend more on non-productive expenditure like medical expenditure and ceremonies. The income from horticulture, income from livestock, household assets and education shows highly positive impact on non productive expenditure. It indicates that despite being educated, a high percentage of their income is being spent on non productive activities. The probable reasons for this observation could be attributed to the fact that the consumption of alcohol and tobacco is high among people of Tripura. So, if there is any increase in income, the people tend to spend more money on the same. Furthermore, the dowry system is prevalent. This system compels them to spend more on non-economic activities. Besides this, the expenditure on medication is quite high which reflects the poor infrastructure facilities like lack of medical facilities, clean water supply, sanitation etc. Because of this, all income variables show positive impact on non

productive expenditure. Owning land and savings has inverse relationship with non-productive expenditure. The reason behind it, those who own land have to incur high expenditure on inputs and are left with little amount for non-productive expenditure. In fact, they have to save for spending money on productive activities also. The animal graze variable is positive and significant at 5 percent level. It indicates as the animal graze increases by a unit the increase in non productive expenditure increases by 5444.98 units because the animals are not guided for grazing in the forest and are susceptible to dangers and hence increase the expenditure by the people on their medication.

The table 4 shows the factors that influence the participation of people in the JFMC meetings as estimated through logit and probit specification. In logit model, the district dummy shows positive significant at 20% level. It means that if the person is a resident of South Tripura, the probability of participating in the JFMC meeting is as high as 2.84 units when all other independents are held constant at their mean value. The probability of participating in JFMC meeting can be improved by improving views of JFMC members about 8.72 units. It indicates need for further improvement in the level of awareness about JFM activities, so that the probability of participating in the JFM activities can be improved significantly. There is a pressing need to establish a strong information dissemination system for encouraging their participation in JFMC meetings as well as to increase the number of activities undertaken by JFMC. The level of education has high and negative significant impact on the participation of JFMC meeting at 1% level. This indicates that, participation of educated people in JFMC is less because the more they are educated the higher is their tendency to migrate to urban areas. The migration of educated people can be checked through creation of employment opportunities within the village. The Forest Department can play a vital role in motivating and involving people in the developmental activities. The study further explores the role of gender in influencing the probability of participating in JFMC meeting. This variable being positive indicates that if the person is male, the probability of participating in the JFMC meeting is higher by 5.22 units. Basically, it highlights the dominance of male for participating in the JFMC meetings. The ground for gender favoritism indicates the presence of patriarchal family system, where all the key decisions are taken by male members in the family. The importance of the female is subdued and they are mainly engaged with household chores. Most of the richer people save more for the productive and non-productive expenditure. If a person saves more then the probability of the participation in the JFMC meeting is less. It implies that the richer people are less interested to attend the JFMC meeting, because they are not relying

on income from the JFM activities for their survival. The variable animal graze shows positive and highly significant impact on participating in the JFMC meetings. The reason behind it, forest of Tripura is burdened with rights and concessions which are clearly defined in the notification issued in April 1952 with the subsequent modifications made thereafter. As per the notifications, the bonafide householders and cultivators who are inhabitants of villages entirely surrounded by Reserved Forests are entitled to cattle grazing free of charge in protected forests (upto 8 cows and 2 calves)⁷. These rights and concessions act as motivating influence for joining JFMC and participating in their meetings. The overall fitness of this model is good and pseudo R-square is 0.89.

The results from probit model are quite comparable. The results of these two models are almost similar, but the distribution of error is different. The interaction effect between fodder collection and district variable is negatively significant at 5% level in probit model and remaining significant variables are same as in logit model. In the model, animal graze variable gets positive significant impact but the fodder collection has negative significant impact on the participating in the JFMC meeting. It means if the respondent is going for the fodder collection, his participation in the JFMC meeting is very less in South Tripura. South Tripura district has more extensive agricultural activities, and because of this, more residues (husk) are generated which are used as fodder for animals. Hence this factor does not influence them to participate in the JFM activities, but some other activities may influence them to participate in the JFM meetings. The overall goodness of fit is standard; the pseudo R-square is 0.87.

IX. Research Output and Policy Implications of the Study

The state of Tripura is one of the pioneers in formulating JFM innovative programs. The JFM program is devised to ensure active participation and involvement of local communities in the protection and development of the forests on the basis of sharing of usufructs. The study highlighted few important points in South and North Tripura district, which would enhance their socio-economic conditions and improve active participation in the JFMC meetings. In sum, the study shows that, South district JFMC' households are contributing significantly to their socio-economic conditions compared to North district JFMC' households. The existing JFM institutional system has been well formulized in both districts, but the management progress of the JFM in South Tripura district varies from that of North Tripura district in terms of quality

⁷ Official document, Forest Department (Govt. of Tripura)

process. Since JFM is a concept which is run by forest department and villagers jointly, the responsibility of the running management lies down with villagers and forest department officials. This thought process has to go together to make it more effective in the long run. So, there could be a chance, the problem may recline with forest department or villagers. The study tried to analyze the problems through interacting with villagers as well as forest department officials. The study found that the North district people have less awareness about JFM concept because of forest department official's limited interaction with them, but from the villagers point of view, there is lack of awareness about the JFM role, the JFM institutional system are not democratic and there is social barriers like hierarchy in the social groups and dominance of particular social group in the executive committee. So, the study suggests that, the focus should be on rearranging the institutional system to make JFM more effective and efficient. The study further recommends that JFMC should have proper capacity building mechanism. Further more information technology should be improved at the management level. The North Tripura district has fewer infrastructure facilities compared to South Tripura district. For example, the lack of sanitation facilities and safe drinking water quality affects their health condition, because of this the people have to spend more money on medication. So, the study suggests that North district has to improve their infrastructure facilities to enhance villagers' socio-economic conditions, as the infrastructure and income generation activities are highly linked. Therefore, before formulizing the nitty-gritty of institutional setup, Govt. of Tripura should focus more on infrastructure developmental activities. The overall finding suggests that the socio-economic condition of people associated with JFMC in South district has improved than that of North district.

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Table 1: Socio-Economic Characteristics and Attitudinal Questions of the Surveyed Population at South Tripura

Variables	Observations	Units	Mean	Standard Deviation	Minimum	Maximum	Percentage
Age	100	Number	43.58	14.18	21	81	
Sex	100						
<i>Male</i>							90
<i>Female</i>							10
Social Group	100						
<i>SC and ST</i>							45
<i>OBC</i>							55
<i>Other</i>							0
Education	100						
<i>Illiterate</i>							37
<i>Primary</i>							24
<i>Secondary</i>							25
<i>Higher Secodary</i>							5
<i>Under Graduate and above</i>							9
Land Ownership	100	Kani(1 Kani=6.25 Ha)	2.069	3.07745	0	16	
<i>Landless</i>							45
<i>Landowner</i>							55
Production of Paddy in Different Seasons							
<i>Zaid (Summer)</i>	100	Kilogram	201.2	680.005	0	3600	
<i>Kharif (Monsoon)</i>	100	Kilogram	179.2	519.978	0	2800	
<i>Rabi (Winter)</i>	100	Kilogram	506	982.452	0	5760	
Assets Details							
Domestic Assets							
<i>T.V</i>	100						21
<i>Radio</i>	100						34
<i>Refrigerator</i>	100						1
<i>LPG</i>	100						4
<i>Fan</i>	100						16
Agricultural Assets							
<i>Tillers</i>	100						2
<i>Plough</i>	100						15
<i>Water Pump</i>	100						7
<i>Tractor</i>	100						1
Vehicles							
<i>Car</i>	100						2
<i>Motorcycle</i>	100						3
<i>Bicycle</i>	100						32
<i>Auto -Richkshaw</i>	100						0
Fuel Consumption							
<i>Fuel Wood</i>	100	Kilogram	1391	1023.06	0	4800	
<i>Dung</i>	100	Kilogram	61.92	599.907	0	6000	
<i>Kerosene</i>	100	Liters	63.69	92.7586	0	600	

<i>LPG</i>	100	Kilogram	5.16	26.7754	0	174	
Total Expenditure	100	Rupees	2905 8	38528.7	285 0	324440	
<i>Productive Expenditure</i>	100	Rupees	1818 4	12419.3	155 0	67830	
<i>Non-Productive Expenditure</i>	100	Rupees	5755	27483.8	0	250000	
Households Whose Cattle Indulge in Open Grazing in Forest Throughout the Year	100						21
Joint Forest Management Committee Details							
Respondents Holding JFM Membership	100						62
Member respondents attending JFM Meeting							
<i>Never</i>							40
<i>Once</i>							30
<i>Twice</i>							9
<i>More than Twice</i>							21
Member respondents Participating in Micro Plan							37
Members respondents-Views on JFM Activities							
<i>Not At All Beneficial</i>							40
<i>Somewhat Beneficial</i>							19
<i>Beneficial</i>							41
Sources of Income							
<i>Annual Income - Agricultural Labour</i>	100	Rupees	5854	11045	0	84000	
<i>Annual Income- Forestry Labour</i>	100	Rupees	891	3422.45	0	25200	
<i>Annual Income - Other Labour</i>	100	Rupees	1195	4097.84	0	23100	
<i>Income - Agricultural Crops</i>	100	Rupees	2595	6454.08	0	32000	
<i>Income - Horticulture Crops</i>	100	Rupees	445	2889.13	0	26000	
<i>Income - Forest Products</i>	100	Rupees	421.2	3081.18	0	27000	
<i>Income- Livestock</i>	100	Rupees	1952	5876.33	0	42000	

Table 1 (Cont.): Socio-Economic Characteristics and Attitudinal Questions of the Surveyed Population at North Tripura

Variables	Observations	Units	Mean	Standard Deviation	Minimum	Maximum	Percentage
Age	100	Number	39.09	11.541	17	80	
Sex	100						
<i>Male</i>							89
<i>Female</i>							11
Social Group	100						
<i>SC and ST</i>							87
<i>OBC</i>							11
<i>Other</i>							2
Education	100		0.78	0.82364			
<i>Illiterate</i>							47
<i>Primary</i>							28
<i>Secondary</i>							25
<i>Higher Secodary</i>							
<i>Under Graduate and above</i>							
Land Ownership	100	Kani(1 Kani=6.25 Ha)	1.624	2.8149	0	15	
<i>Landless</i>							54
<i>Landowner</i>							46
Production of Paddy in Different Seasons							
<i>Zaid (Summer)</i>	100	Kilogram	134.4	347.39	0	2000	
<i>Kharif (Monsoon)</i>	100	Kilogram	86.5	610.374	0	6000	
<i>Rabi (Winter)</i>	100	Kilogram	134.4	347.39	0	2000	
Assets Details							
Domestic Assets							
<i>T.V</i>	100						10
<i>Radio</i>	100						26
<i>Refrigerator</i>	100						1
<i>LPG</i>	100						1
<i>Fan</i>	100						11
Agricultural Assets							
<i>Tillers</i>	100						0
<i>Plough</i>	100						13
<i>Water Pump</i>	100						0
<i>Tractor</i>	100						1
Vehicles							
<i>Car</i>	100						1
<i>Motorcycle</i>	100						1
<i>Bicycle</i>	100						10
<i>Auto -Richkshaw</i>	100						1
Fuel Consumption							
<i>Fuel Wood</i>	100	Kilogram	2351.4	1884.71	60	8400	
<i>Dung</i>	100	Kilogram	102.72	417.146	0	3000	
<i>Kerosene</i>	100	Liters	46.38	22.2197	0	180	

<i>LPG</i>	100	Kilogram	1.8	18	0	180	
Total Expenditure	100	Rupees	22028.1	12850	2860	63650	
<i>Productive Expenditure</i>	100	Rupees	16435.1	10202.5	1360	53460	
<i>Non-Productive Expenditure</i>	100	Rupees	1814.5	2179.87	0	11750	
Households Whose Cattle Indulge in Open Grazing in Forest Throughout the Year	100						26
Joint Forest Management Committee Details							
Respondents Holding JFM Membership	100						41
Member respondents attending JFM Meeting							
<i>Never</i>							59
<i>Once</i>							10
<i>Twice</i>							9
<i>More than Twice</i>							22
Member respondents Participating in Micro Plan							2
Member respondents- Views on JFM Activities							
<i>Not At All Beneficial</i>							60
<i>Somewhat Beneficial</i>							6
<i>Beneficial</i>							34
Sources of Income							
<i>Annual Income - Agricultural Labour</i>	100	Rupees	3674.5	10312.5	0	76650	
<i>Annual Income- Forestry Labour</i>	100	Rupees	692.92	17094.4	0	81000	
<i>Annual Income - Other Labour</i>	100	Rupees	5375.8	8569.24	0	36500	
<i>Income - Agricultural Crops</i>	100	Rupees	144	667.321	0	4000	
<i>Income - Horticulture Crops</i>	100	Rupees	1641.25	7117.67	0	49250	
<i>Income - Forest Products</i>	100	Rupees	317.5	1617.4	0	10000	
<i>Income- Livestock</i>	100	Rupees	436.3	2545.93	0	24000	

Table 2: Descriptive Statistics

Variables	Variable Name	Definition	Variable Code
wage_forest	Wage Forest	Annual income earned by labour from forestry activities	Actual Numbers
wage_other	Wage Other	Annual income earned by labour in areas other than farming and forestry activities like in construction and repairing of watersheds, lakes, roads etc.	Actual Numbers
prod_exp	Productive expenditure	Productive expenditure comprises of expenditure on food, transportation, electricity, education, fodder collection, fuel, cost of cultivation, vehicle maintenance cost	Actual Numbers
non_prod_exp	Non-productive expenditure	Non-productive expenditure comprises of ceremonies, festivals, marriage and alcohol & tobacco.	Actual Numbers
age (coefficient)	Age	Actual age of the respondent (in years)	Actual Numbers
Sex	Sex	Sex of the respondent	sex=1 then male, sex=0 then female
cast_sc_st	Caste –SC/ST	SC and ST respondents	cast_sc_st=1 then respondent is SC or ST cast_sc_st= 0 then otherwise
cast_obc	Caste- OBC	OBC respondents	cast_obc =1 then respondent is OBC cast_obc=0 then otherwise
edu	Education	Education of the respondent	edu =0 then illiterate, edu=1 then primary education. edu =2 then secondary education edu =3 then higher secondary education, edu= 4 then under graduate and above
Jfm	JFM	Joint Forest Management Committee's membership of the respondent	Jfm=1 then respondent holds JFM membership Jfm= 0 then otherwise
jfm_attendance	JFM Attendance	Meetings attended by the JFM member	jfm_attend~e=0 then never jfm_attend~e=1 then once jfm_attend~e=2 then twice jfm_attend~e=3 then more than twice
Jfm_district	JFM District	Interaction effect between JFM and district	jfm_district=1 then the respondent is JFM member and residing in South Tripura district. jfm_district=0 then otherwise
view_jfm	View JFM	View of the respondent about the JFM activities	view_jfm=0 then not at all beneficial view_jfm=1 then some what beneficial view_jfm =2 then beneficial
district_d	District Dummy	Dummy for the district	district_d=1 then South Tripura district district_d=0 then North Tripura district
JFM_meet_D	JFM Meeting Dummy	Dummy for JFM Meeting	JFM_meet_D=1 then the person participates in the JFM meeting JFM_meet_D =0 otherwise.
wage_agri	Wage Agriculture	Annual income earned by labour in the farm	Actual Number

Table 3: Results of Multiple Regression Function

Dependent Variable	prod_exp	non_prod_exp
age (coefficient)	-77.88016 (-1.29)*****	181.2438 (1.68)***
Sex \$	-585.3253 (-0.23)	3518.663 (0.77)
Edu	1605.921 (2.05)**	2919.758 (2.09)**
Own \$	448.9849 (1.35)*****	-1360.872 (-2.29)**
Save \$	-1662.762 (-1.04)	-4931.166 (-1.74)**
animal_graze \$	-227.0791 (-0.13)	5444.975 (1.72)**
Jfm \$	-9110.422 (-2.59)*	-159.2006 (-0.03)
jfm_attend~e	724.9322 (0.61)	-230.1099 (-0.11)
district_d \$	-5482.359 (-2.23)**	3275.321 (0.75)
jfm_district \$	8802.971 (2.80)*	-4239.374 (-0.75)
wage_agri	.0589115 (0.80)	-.0673542 (-0.51)
wage_forest	.1254328 (1.88)***	.0623877 (0.52)
wage_other	.143495 (1.16)	.1522695 (0.69)
inc_crops	.3630952 (1.99)**	.2214206 (0.68)
inc_horti	-.0074074 (-0.05)	1.120487 (4.32)*
inc_forest~t	.012701 (0.04)	-.1947312 (-0.36)
HH_asset	2009.5 (3.21)*	.6930971 (2.17)**
inc_livest~k	.0573843 (0.32)	2499.623 (2.24)**
cast_sc_st \$	-3745.495 (-0.51)	1768.372 (0.13)
cast_obc \$	702.1139 (0.09)	4422.423 (0.33)
Cons	21541.1 (2.65)*	-14621.12 (-1.01)
Number of Observation	200	200
Prob>F	0.000	0.000
R-Squared	0.2803	0.2246
Adj R – Squared	0.1999	0.1380

Note: \$ indicate that Dummy Variable, * indicate that 1%, ** 5%, ***10%, ****15%, *****20% significance level

Table 4: Results of Logit and Probit Model

Dependent Variable	Logit Model	Probit Model	Marginal Effect for Probit Model
	JFM_meet_D	JFM_meet_D	JFM_meet_D
age (coefficient)	-.0101154 (-0.24)	-.0121915 (-0.61)	-.0036658 (-0.62)
Sex \$	5.228166 (1.53)****	2.15999 (1.54)****	.7173967 (2.48)*
edu	-1.94291 (-2.41)*	-.8814072 (-2.43)*	-.2650274 (-2.25)**
own \$.135388 (0.58)	.0906151 (0.90)	.0272468 (0.85)
Save \$	-3.999943 (-1.76)***	-1.912196 (-1.87)***	-.5936269 (-2.23)**
animal_graze \$	2.898076 (1.70)***	1.504277 (1.85)***	.3165991 (2.13)**
fuelconsum~n	.0001932 (0.34)	.0000285 (0.11)	8.57e-06 (0.11)
dung_consum	.0005834 (0.67)	.0003794 (0.96)	.0001141 (0.94)
Koresene	.0109422 (1.00)	.0035545 (0.67)	.0010688 (0.66)
lpg_consum	-.0079086 (-0.10)	-.0043308 (-0.14)	-.0013022 (-0.14)
view_jfm	8.721295 (3.76)*	3.980948 (4.43)*	1.197018 (3.79)*
prod_exp	.0000405 (0.42)	.0000185 (0.46)	5.56e-06 (0.45)
non_prod_exp	-.0000915 (-0.94)	-.0000393 (-1.13)	-.0000118 (-1.17)
district_d \$	2.847233 (1.36)*****	1.738838 (1.68)***	.4942736 (1.76)***
wage_agri	.0000135 (0.17)	.0000139 (0.47)	4.19e-06 (0.47)
wage_forest	-.0000466 (-0.76)	-.0000154 (-0.51)	-4.64e-06 (-0.50)
wage_other	.0000411 (0.29)	.000044 (0.80)	.0000132 (0.81)
inc_crops	-.0001302 (-0.77)	-.0000492 (-0.64)	-.0000148 (-0.62)
inc_horti	-.0000561 (-0.18)	-.0000206 (-0.22)	-6.20e-06 (-0.22)
inc_forest~t	-.0001403 (-0.62)	-.0000626 (-0.79)	-.0000188 (-0.80)
fuel_collect	1.560155 (1.04)	.6970845 (1.02)	.209604 (1.01)
cast_sc_st \$	7.344863 (0.18)	2.963515 (0.20)	.8464521 (0.36)
cast_obc \$	10.25639	4.549344	.7730861

	(0.25)	(0.30)	29 (0.50)
HH_assets	.5847969 (0.81)	.2560359 (0.83)	.0769866 (0.83)
Foddercollec \$	1.278642 (0.32)	.8566011 (0.58)	.245556 (0.63)
inc_livest~k	.0000593 (0.45)	.0000307 (0.48)	9.23e-06 (0.49)
foddercoll~t \$	-4.468053 (-0.94)	-2.690064 (-1.44)****	-.7991565 (-2.33)**
_cons	-19.63287 (-0.47)	-8.456255 (-0.55)	
Number of observation	200	200	
Prob>chi2	0.0000	0.000	
Pseudo R2	0.8874	0.8716	

Note: \$ indicate that Dummy Variable, * indicate that 1%, ** 5%, ***10%, ****15%, *****20% significance level

Appendix A – Figure 1 - Tripura State

