Household drivers of forest dependence for employment support among tribes of Jharkhand, India

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ABSTRACT

This study investigated the household drivers of forest dependence for employment support among tribes of Bundu block in Ranchi, Jharkhand (India). Data were collected through structured interviews and non-participant observations administered to 164 households sampled using multi-stage random sampling technique. Descriptive and inferential statistics were employed to analyze the data. Results indicated that fodder (34.04%) was the major forest-based employment source followed by fuel wood (24.38%), paid employment (18.31%), cottage industry (16.49%), tooth brush (3.00%), fruit (1.63%), *mahu*a (*Madhuca latifolia*) flower (0.75%), vegetables (0.57%), oilseeds (0.47%), ethno-medicines (0.20%) and timber (0.17%). Average forest-based employment accrued to the tribal household was 108.23 man-days annum^{-1}. Regression analysis revealed that education, land holding, gross annual income, proximity to the forest, forest visit and forestry resources possession significantly influenced forest dependence for employment support and the R^2 (0.786) indicated that 78.60% of the variation in the forest-based employment was explained by the household drivers. The findings and perspective of the study could be crucial bases in planning and administration of strategies for sustainable management of the forest resources and improvement in forest-based employment opportunities for livelihood security and socioeconomic development of the tribal people in the locality.

Key words: Dependence, drivers, employment, forest, household, tribe, jharkhand, India.

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Forests provide a wide spectrum of livelihoods for tribal communities in the form of direct employment, self-employment and secondary employment in India (Gera, 2002; Shendage *et al.* 2009). Direct employment is provided by the forest department and other line departments in the form of managerial, technical, research, planning and executive jobs (Islam *et al.* 2014). Other direct employments consisted of labour force for rural masses generated by these departments under regular forestry activities are development

and maintenance of forests, research and training, survey of forest resources, protection and conservation, soil and water conservation, felling, logging, conversion, transport and storage of timber, harvesting, collection and processing of Non-Timber Forest Products (NTFPs), preparation of nurseries, fencing, soil working, transplanting, planting, tending operations, watering, fertilizer and pesticide application, protection and management of plantation and infrastructure development (Kumar, 2009; Maske *et al.* 2011). The self-employment in forestry create local people's livelihoods through sale of fuel wood and fodder, grazing, lopping and grass cutting, forest based handicrafts and cottage industries, sericulture, *lac* cultivation, bee keeping, charcoal burning, leaf plate making, liquor making, rope making and basketry, medicines, collection, processing and marketing of NTFPs, cultivation of agricultural crops under agroforestry, livestock rearing, social and farm forestry and availing of rights and concessions (Sarmah and Arunachalam, 2011; Shit and Pati, 2012). The application of local skills and village-level technology in wood or NTFPs based enterprises provide secondary employment and livelihood opportunities, main amongst are saw milling, rayon, pulp and paper, ply wood and panel products, wood seasoning and preservation, tanning, sports goods, match splints, veneers, wooden boxes, bamboo and cane products, agricultural implements, furniture, structural timbers, musical instruments, *bidi* making, educational goods, wood carving, wooden utensils *etc.* (Singh and Quli, 2011; Sharma *et al.* 2015). Forest development integrated with agricultural and industrial progress has great potential to enhance livelihood security, poverty reduction and food security for vulnerable section of society in rural India (Tewari, 2014; Shackleton and Pandey, 2014)

Tribal people are an integral component of forests having inseparable symbiotic and mutually reinforcing relationship and emotional attachment in Bundu block of Ranchi district in Jharkhand (Islam *et al.* 2015). They are primarily major gatherers of a wide range of forest resources besides hunters, herders, simple farmers, traders and labourers (Sahu, 2008). They form the major labour force in forestry operations, forest based enterprises and industries, protection and conservation of forest resources and implementation of forestry projects (Islam *et al.* 2014). The forest resources are used by the tribal communities to meet their daily livelihood needs and satisfy their social, economic, cultural, religious, ethical, traditional, spiritual, ecological and political aspirations (Sivaji, 2009).

Despite living in resource rich landscape the tribes are suffering from acute poverty, illiteracy, remoteness, low socio-economic status, low infrastructures and communication facilities, lack of government services, markets and jobs and livelihood stress (Anon., 2010). While, the significant contribution of forest resources based employment opportunities on poverty alleviation, socioeconomic development and forest conservation are largely unnoticed (Singh *et al.* 2009). Concern over the fate of the tribes who depend on forest resources for their livelihood has led to strengthen the forest-based employments and create new forest based employment avenues by mobilizing the existing forest resources. By doing so, the tribal people can secure their rights and concessions to the forests, develop sustainable management regimes, preserve the forest, conserve its resources and enhance household income. With this background the current research was contemplated to analyze the household drivers of forest dependence for employment support among tribal households of Jharkhand, India.

DATA BASE AND METHODOLOGY

Study area description

The study was undertaken in Bundu block ($23^0$11'- $23^0$18' North latitude and $85^0$35'- $85^0$58' East longitude) of Ranchi district, located to the south-east of the state capital Ranchi, at an altitude of 337 meters (Fig. 1.). The block has a total geographical area of 25,097 ha which is differentiated as un-irrigated cultivable land (69.3%), forest (17.4%), irrigated cultivable land (8.4%), culturable wasteland (3.6%) and unculturable wasteland (1.3%) (Anon., 2009). Total population is 62,509 people (31,624 males and 30,885 females) living in 11,495 households, in 88 revenue villages of the block (Census of India, 2011). The break-up of the total population is as: Scheduled Tribe (*Munda, Oraon* and *Lohara*) (60.7%), Scheduled Caste (4.8%) and other social groups (34.5%). The population density, number of persons per family and sex ratio are 249/km², 5.4 and 978 female/1000 male, respectively. The literates in the block are 23,572 (16,084 males and 7,488 females), accounting for 44.0% of the total population (Anon., 2009). The forests comprise northern tropical dry deciduous forest (5B/C2) (Champion and Seth, 1968) falling under Bundu Range of Khunti Forest Division. Forest resources are the 2nd important contributor to the total livelihoods after agriculture among forest fringe households in the locality (Islam *et al.* 2013).
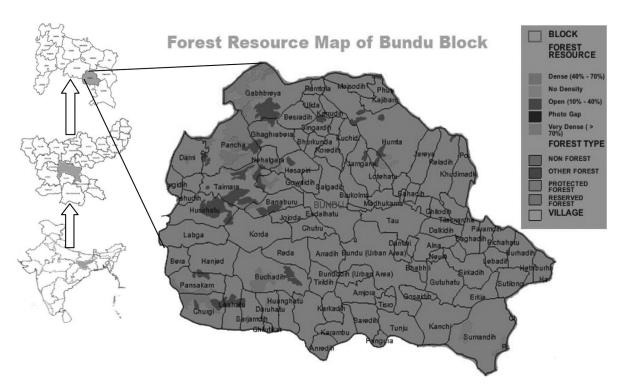
Fig. 1: Location of the study area

Table 1: Forest-based paid employment among tribal households (N=164)

Households involved in paid employment	Size of employment (Man-days annum^{-1})	Average employment (Man-days household^{-1} annum^{-1})	Wage rate (₹ man-day^{-1})
58 (35.37%)	3250	19.82	145.54

Table 2: Forest-based self-employment among tribal households (N = 164)

Forest resource		Household involved annum^{-1}	Quantity collected (kg annum^{-1})	Household consumption (kg annum^{-1})	Quantity sold (kg annum^{-1})	Size of employment (man-days annum^{-1})
Fuel wood		164 (100)	616.52$^\Delta$	598.60$^\Delta$	17.92$^\Delta$	4326.46
Fodder		162 (98.78)	2837.35$^\Delta$	2824.55$^\Delta$	12.80$^\Delta$	6041.00
Timber[a]		164 (100)	87.78$^£$	56.78$^£$	31.00$^£$	30.65
Cottage industry	Sal leaf plate	81 (49.39)	56.05$^\infty$	4.05$^\infty$	52.00$^\infty$	2421.00
	Lac	67 (41.85)	670.00	0.00	670.00	505.63
Fruit	Fruits (Kg)	115 (70.12)	12533.50	3915.50	8618.00	265.57
	Bel (No.)	30 (18.29)	1147$^{\Omega\iota}$	150$^{\Omega\iota}$	997$^{\Omega\iota}$	22.94
Vegetable		121 (73.78)	4397.00	1260.00	3137.00	101.22

Oilseeds	115 (70.12)	3220.00	345.00	2875.00	82.84
Ethno-medicine	11 (6.71)	84.00	0.00	84.00	35.40
Tooth brush	164 (100)	10656§	3936§	6720§	532.80
Mahua flower	132 (80.49)	6666.00	990.00	5676.00	133.32
Total	-	-	-	-	14498.83
Average	-	-	-	-	88.41

Figures in parentheses show percentages; Δ = tonne, £ = m^3; ∞ = lakh pieces; $\Omega\iota$ = pieces; § = bundles; a Volume of timber = 0.0346 m^3.
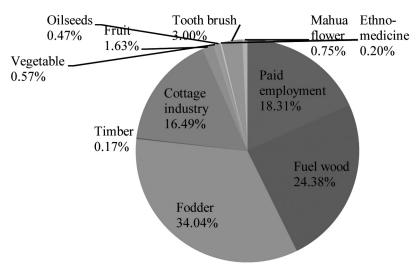

Fig. 2: Forest-based employment composition in tribal households

Table 3: Descriptive statistics of household drivers of tribes (N=164)

Drivers (Code)	Mean	Std. Dev.	95% Confidence Interval for Mean		Minimum	Maximum
			Lower Bound	Upper Bound		
Education (X_1)	1.36	1.40	1.15	1.58	0	6
Family composition (X_2)	2.96	0.87	2.82	3.09	2	4
Land holding (X_3)	1.89	1.00	1.73	2.05	1	4
Wealth status (X_4)	8.03	3.27	7.53	8.54	2	15
Main occupation (X_5)	2.85	1.14	2.67	3.03	1	6
Gross annual income (X_6)	27908.53	13865.61	25770.56	30046.51	9000	60000
Proximity to the forest (X_7)	5.96	2.52	5.57	6.35	1	10
Forest visit (X_8)	2.20	0.97	2.05	2.35	0	3
Forestry resources possession (X_9)	0.27	0.16	0.25	0.29	0.08	0.65
Urban closeness (X_{10})	11. 64	4.34	11.04	12.40	4.5	21.50

Table 4: Multiple regression analysis of household drivers with forest-based employment among the tribes (N=164)

Household drivers (Code)	Regression co-efficient (b)	Standard error of 'b'	't' value
Education (X_1)	9.237	1.700	5.433*
Family composition (X_2)	- 0.345	3.629	- 0.095
Land holding (X_3)	12.208	2.585	4.723*
Wealth status (X_4)	0.547	0.777	0.704
Main occupation (X_5)	4.150	2.606	1.592
Gross annual income (X_6)	0.001	0.000	4.242*
Proximity to the forest (X_7)	2.910	0.968	3.007*
Forest visit (X_8)	10.747	2.728	3.940*
Forestry resources possession (X_9)	61.275	16.357	3.746*
Urban closeness (X_{10})	- 0.936	0.586	- 1.596

a = - 14.867 F = 60.99* R^2 = 0.786 Multiple R = 0.894 Adjusted R^2 = 0.799

* = Significant at 5% level of probability

Sampling procedure

Multi-stage random sampling technique was undertaken to select the villages and respondents (Ray and Mondol, 2004). Nine sample villages namely, Korda, Jojoda, Husirhatu, Banaburu, Nehalgara, Ghagrabera, Hesapiri, Roredih and Kuchidih with 10% sampling intensity were selected from the block. The sample for household survey was consisted of 164 households (20%) withdrawn from the selected villages comprising all categories of land holders. Household heads or eldest persons were treated as the respondents.

Data collection and analysis

The data on forest-based paid employment, self-employment and household drivers were collected by personal interviews using a well-structured pre-tested interview schedule and non-participant observations (Mukherjee, 1993). The information regarding forest-based employment collected were households involved in paid employment, size of paid employment, households involved in self-employment, forest resource type, quantity collected, quantity consumed, quantity sold and size of self-employment. The household drivers included were education, family composition, land holding, wealth status, main occupation, gross annual income, proximity to the forest, forest visit, forestry resources possession and urban closeness. Descriptive and inferential statistics *viz.*, frequency

(f), percentage (%), mean (x), standard deviation and multiple regression (Snedecor and Cochran, 1967) were used for data analysis. Forest-based employment was the regress and the household drivers were the repressors. The implicit form of the equation is thus:

$$Y = a + b_1x_1 + b_2x_2 + \ldots\ldots + b_{10}x_{10}$$

Where

Y = Forest-based employment

x_1-x_{10} = Household drivers

a = Constant or intercept and

b_1-b_{10} = Regression coefficients

RESULTS AND DISCUSSION

Paid employment

The average direct paid employment accrued to the tribal people was 19.82 man-days household[-1] annum[-1] and the percentage of households involved in direct paid employment was 35.37% (Table 1). By and large, Forest Department generates considerable size of direct employment under regular forestry activities in forests in the form of casual labour. Main forest-based activities from which people derive employment and income are land preparation, nursery operations and plantation works, development of soil and water conservation

measures, *tendu* leaf collection and bamboo works. Usually, people get contractual employment on daily-wage basis for these forestry operations because the employment in these operations is largely sporadic owing to its seasonal nature.

No wood or NTFPs based enterprises have been established in the area so far in spite of availability of huge forest resources, labour input, skill and other opportunities. Nonetheless, there is a greater prospects of establishment of forest resources based enterprises which will strengthen the forest based tribal livelihoods through employment and income generation for unemployed people.

Self-employment

Fodder was the major (6041.00 man-days annum^{-1}) forest-based employment source followed by fuel wood (4326.46 man-days annum^{-1}), cottage industry (2926.63 man-days annum^{-1}), tooth brush (532.80 man-days annum^{-1}), fruit (288.51 man-days annum^{-1}), *mahua* (*Madhuca latifolia*) flower (133.32 man-days annum^{-1}), vegetables (101.22 man-days annum^{-1}), oilseeds (82.84 man-days annum^{-1}), ethno-medicines (35.40 man-days annum^{-1}) and timber (30.65 man-days annum^{-1}) among tribal households. Forest resources extraction and marketing generated average unpaid self-employment opportunity of 88.41 man-days household^{-1} annum^{-1} and household's involvement in different forest resources collection varied from 6.71% to 100% (Table 2.). The forest-based employment composition is differentiated as: fodder (34.04%), fuel wood (24.38%), forest-based paid employment (18.31%), cottage industry (16.49%), tooth brush (3.00%), fruit (1.63%), *mahua* (*Madhuca latifolia*) flower (0.75%), vegetables (0.57%), oilseeds (0.47%), ethno-medicines (0.20%) and timber (0.17%) (Fig. 2.). Altogether, the forest resources generated 108.23 man-days of employment per household.

Livestock rearing is key component of tribal economy and the forests in the locality offer plenty of fodder which is collected and marketed in huge quantity. Collection of fodder is labour intensive activity and time consuming process composing major employment source for the tribes. Fuel wood was the next important employment generating resource because the fuel wood is tribal society's conventional energy source constituting the mainstay of almost all household's cooking and heating fuel providing ample employment opportunities. The Forest Department generates sizeable paid employment

as casual labour on contractual daily-wage basis to execute various forestry operations creating enormous employment opportunities. The cottage industries viz., *sal* leaf plate making and *lac* cultivation plays a prominent role in the tribal economy contributing a sizeable share in their employment. People stitch raw plates and sell in the local weekly markets earning meager income, however, there is huge potential of employment enhancement by value addition through mechanized moulding. *Lac* cultivation is practiced on *palas* (*Butea monosperma*), *ber* (*Zizyphus mauritiana*) and *kusum* (*Schleichera oleosa*) using both *rangeeni* and *kusmi* strains. Collection and sale of tooth brush, fruits, *mahua* (*Madhuca latifolia*) flower, vegetables, oilseeds, ethno-medicines and timber generated less than 5 days of employment for the tribal households, as their collections procedures was simple, less labour intensive and less time consuming. Tooth brushes of *sal* (*Shorea robusta*), *karanj* (*Pongamia pinnata*), *neem* (*Azadirachta indica*) and *mahua* (*Madhuca latifolia*) are collected and sold by the tribal children and women in local or urban markets which fetches good returns. Mango (*Mangifera indica*), *jamun* (*Syzigium cumini*), *ber* (*Zizyphus mauritiana*), *imli* (*Tamarindus indica*), *bhelwa* (*Semecarpus anacardium*), *kendu* (*Diospyros melanoxylon*), *toont* (*Morus alba*), *bel* (*Aegle marmelos*), jackfruit (*Artocarpus heterophylus*) and *barhar* (*Artocarpus lakoocha*) are the main edible fruits collected, consumed and sold by the tribes. Dried *mahua* flowers are chief article of trade because the country liquor extracted from it is consumed by the people almost in all functions, ceremonies and festivals. Important vegetables collected and sold for earnings by the local population included *koinar* (*Bauhinia purpuria*) leaf, bamboo (*Bambusa arudinacea*) corn, *kachnar* (*Bauhinia variegata*) flower, *phutkal* (*Ficus glabella*) leaf, *jirhul* (*Indigofera arborea*) flower, *rugra* (*Lycoperdon spp.*) basidiocarp and *khukhri* (*Agaricus compestris*) basidiocarp. Oilseeds of *chironji* (*Buchanania lanzan*), *mahua* (*Madhuca latifolia*), *kusum* (*Schleichera oleosa*), *sal* (*Shorea robusta*), *karanj* (*Pongamia pinnata*) are collected and traded in good quantity because the oil extracted from the oilseeds are consumed in cooking, lighting, massage, medicinal or lubrication. *Chirayita* (*Swertia angustifolia*), *harra* (*Terminalia chebula*) and *bahera* (*Terminalia belerica*) are the famous medicines collected, processed and sold by the tribes in local markets. Although, timber collection provides least employment opportunities but it is a major income source due to its high market rate and demand as it is an

important material for rural housing, agricultural implements, furniture, carts and carriages, fencing, cattle shed, store house, scaffolding, ladder, cremation *etc*.

Forest resources contribute to employments for the large section of poor tribes living in forests of most developing countries (Langat *et al*. 2016). Forest-based employments vary across tribal households and contribute significantly to the total household employment (Melaku *et al*. 2014). The size of forest-based employments among tribal households depends on multiple factors like types of resources, household consumption, availability and market price, degree of effort expended and socioeconomic condition (Opaluwa *et al*. 2011). Forest-based employments play a vital role in the livelihood support of tribes and forest dwellers in terms of subsistence and cash income because the alternative options are scarce or even absent (Olaniyi *et al*. 2013). Although, the forest-based employments are sporadic owing to its seasonal nature but, it is significant as the natural heritage supports huge richness and diversity of forest resources in the locality (Singh *et al*. 2009). Forest-based employments are viewed as not a primary source but are complementary either on a part-time or full-time basis and considered an important source of self-esteem, pride and independence (Usman *et al*. 2016).

Household drivers of tribes

Household drivers averaged for the tribes (Table 3.) indicated the preponderance of low literate people (1.36) having nuclear and large sized families (2.96), marginal sized land holding (1.89), low wealth status (8.03), engaged mainly in agriculture (2.80) and earning gross annual income of ₹ 27908.53. Proximity to the forests was 5.96 km where the surveyed households visit frequently (2.20); about 0.27 ha of land was possessed under forestry resources and the mean distance from urban areas was 11.64 km.

Low literacy is due to unsatisfactory socioeconomic conditions, lack of educational facilities, higher involvement of youths in livelihood earnings and apathy towards higher education (Pal, 2011). Prevalence of nuclear and large sized families is due to emergent individualism leading to independent life with personal assets and proper accommodation (Kumar *et al.* 2010). The nuclear and neo-local structure of families advocated early fragmentation of land from generation to generation and among married off-springs resulting in marginal size of land holding (Ajake and Enang, 2012). Although different

and varied types of domestic materials were possessed by the households, the overall picture was un-satisfactory, especially in the context of the improved, modern and prestigious material resources (Bedia, 2014). The probable reasons for preponderance of families having medium gross annual income (₹ 30000 to 60000 annum^{-1}) might be that majority of people are either farmer having small sized land holding or petty traders (Bijalwan *et al.* 2012). Agriculture being the prevailing main occupation and back bone of the economy, most of the households either belong to farming families or dependent on farming for their livelihood (Singh and Quli, 2011).

The heterogeneity on proximity to the forests has clear-cut impact in the magnitude of forest-based direct and self employment; the proximate households availed higher employment than the distant households (Saha and Sundriyal, 2012). Frequency of forest visits exerted a strong influence on forest based self-employment; the higher the frequency of forest visits the higher the size of self-employment (Baba *et al*. 2015). The inequalities among households due to forest resources possession differentiate apparently the scale of forest dependence for employment support; the higher the extent of forest resources possession, the lower the dependency on forests for employment support and vice-versa. (Singha *et al*. 2006). The rural-urban stratification has a strong association with the degree of forest dependence for employment support (Nayak *et al*. 2014), hence, the higher the urban closeness of the households the lesser the level of forest-based employment and vice-versa.

Multiple regression analysis

The explicit form of multiple regression equation fitted for forest-based employment is presented as:

$$Y = -14.867 + 9.237X_1 - 0.345X_2 + 12.208X_3 + 0.547X_4 + 4.150X_5 + 0.001X_6 + 2.910X_7 + 10.747X_8 + 61.275_9 - 0.936X_{10}$$

Where

Y = Forest-based employment (Man-days household^{-1} annum^{-1})

$X_1 - X_{10}$ = Household drivers

The regression result indicated that among the explanatory variables six variables *viz.*, education, land holding, gross

annual income, proximity to the forest, forest visit and forestry resources possession were statistically significant in influencing the forest-based employment (Table 4). The coefficient of determination (R^2) of 0.786 implies that all the household drivers jointly explained 78.60% of variation on the forest-based employment. The magnitude of F value (60.99) indicated that the R^2 is statistically significant ($p < 0.05$) and all the ten household drivers contributed significantly in the variation of the household forest-based employments.

The regression analysis indicated that among ten explanatory variables, six variables *viz.*, education, land holding, gross annual income, proximity to the forest, forest visit and forestry resources possession had significant contribution to the forest-based employment and thus, were the potential predictors in explaining the variation in the forest-based employment. The education plays a key role in awareness enrichment, improvement in technical know-how, decision making, motivation and livelihood promotion. Land holding and gross annual income are the prominent economic resources which have direct linkages with the forest-based employment. Proximity to the forest, frequency of forest visits and forestry resources possession are the crucial variables having direct impact on forest-based employment, hence, the families with higher custodian of these variables could arrange considerable size of forest-based employment whereas, families devoid of these variables were least involved in the forest-based employment. Several studies (Singha *et al.* 2006; Salehi *et al.* 2010; Ajake and Enang, 2012; Bhatia and Yousuf, 2013; Shackleton and Pandey, 2014; Islam *et al.* 2015) emphasize that household drivers are important actors in forest dependence for employment support.

Conclusions

The findings show that the forest resources play a vital role in the livelihoods of tribal people through enormous paid and self-employment. Forest dependence for employment support is a function of numerous household drivers, such as education, land holding, gross annual income, proximity to the forest, forest visit and forestry resources possession. Forest resources are integral part of day-to-day livelihoods and traditional life style for tribal people. There is massive scope in promotion and development of forest-based employments through proper storage and value addition to forest resources, their domestication and commercialization, organized marketing

system, proper refinement and dissemination of indigenous technologies, training and skill development, generating new avenues through wood and NTFPs based secondary employments. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 also ensured a number of rights and concessions in access of forest resources for millions of tribals and other forest dwellers in Jharkhand. Hence, the livelihoods promotion among tribal people needs a shift of paradigm focusing on forest resources to keep pace with current development and future challenges.

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