



SUSTAINABLE LIVELIHOOD CONTRIBUTIONS OF LIVESTOCK TO THE TRIBAL COMMUNITIES OF JHARKHAND, INDIA

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ARTICLE INFO	ABSTRACT
<p>Received 5 th, May, 2016, Received in revised form 18 th, June, 2016, Accepted 16th, July, 2016, Published online 28th, August, 2016</p> <p>Keywords: Livestock. Livelihood. Production. Sustainable. Tribes</p>	<p>The research was carried out in Jharkhand to document livelihood contributions of livestock to the tribal communities through personal interviews of the selected households by random sampling technique; personal observations and participatory rural appraisal techniques such as transect walk, social mapping, key informants interview, focus group discussion in the sample villages were used to gather data. Sustainable Livelihood Framework (SLF) was followed for the selection of factors and indicators as it provides excellent scope to capture the multidimensional impact of Livestock Production Systems (LPS) on the respondent's livelihoods and weightage of these indicators were assigned by using Principal Component Analysis (PCA). The core outcome of the research was that Cattle+Goat+Pig (C+G+P) was the LPS that contribute primarily towards the sustainable livelihood of the respondents (sustainable livelihood index value- 28.02), closely followed by Cattle+Buffalo+Goat (25.53) and Cattle+Goat (24.61). Overall, it was concluded that compared to other sustainable livelihood components, human capital had least sustainable livelihood index value in all production systems. Thus, the livelihood promotion among ethnic people needs a paradigm shift focusing on sustainable LPS to keep pace with ever increasing food requirement and future challenges in area.</p>
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INTRODUCTION

Livestock is a major contributor to food and nutritional security, and serves as an important source of livelihood for nearly one billion poor people in developing countries (Frans *et al.* 2010). Natural environment surrounding the people provides several goods, services and amenities and other environment resources that forms the livelihood of the tribes (Kumar *et al.* 2016).

In simple terms these are combinations of the capabilities and resources people have (including social, human, financial, natural and physical assets) and the activities they undertake in order to make a living and to attain their goals and aspirations (Bhuvaneshwari 2008). The Sustainable Livelihoods Approach (SLA), are genuinely trans disciplinary as they are produced, disseminated and are applied in the borderland between research, policy, and practice (Knuttsen 2006). Livestock have revolutionized the rural economy of India and development of livestock based livelihood interventions plays a significant role in the employment and income generation, poverty alleviation, migration check, socio-economic development. Livestock plays an integral and significant role in smallholder subsistence in diverse states of India (Pali *et al.* 2013). Properly managed livestock system can

play an important role in mitigating hunger and counteracting environmental degradation resulting in sustainable livelihoods. Moreover, as an important diversified activity, these LPS of the tribes are more crucial for economic development of the state in specific and country in general. The capability of agriculture and livestock production to form sustainable livelihoods of tribal poor is in continuous decline because the current overall endowments of production, distribution of productive assets and productive abilities are out of alignment with what is needed (Maske *et al.* 2011). Consequently, the tribal people are constrained to earn their livelihoods from forest resources (Mohammad *et al.* 2013). Although the marginal dairy farmers have limited income, they have assets and capabilities that can be strengthened to reduce their vulnerability to climate change. These assets or "capital" can be grouped into social capital, natural capital, physical capital, human capital, and financial capital (DFID 1999). Livestock sector has the capacity to provide opportunities for livelihood to people at the place where and in the situation they are. Growing demand for livestock and its products in the urban and rural areas of India emphasizes the opportunity for increased livestock production through livestock development initiatives. Thus the LPS of tribal communities were studied and the contribution of each livestock production systems to total income was analysed and the production

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systems that contribute maximum was recommended for policy action to the Government of Jharkhand.

METHODOLOGY

The research work was carried out in the Jharkhand state which was selected purposively as it is the home of 32 tribal groups that constitute about 26.2 percent (Anonymous 2011) of the state and 8.6 percent of country population. Jharkhand holds 6th rank in terms of tribes population (Anonymous 2011) and livestock contributes to 27 percent of value output from agriculture and livestock system form the major part of the lives of the tribes of Jharkhand (Sirohi and Chauhan 2010). Govindpur block of Dhanbad and Ormanjhi block of Ranchi districts were selected randomly from Jharkhand state. From these two blocks, four villages were selected randomly and from each village 30 farmers were again selected randomly, thus total 120 farmers were selected for the study. The research data were collected using various data collecting methods like personal interviews; personal observations and participatory rural appraisal such as transect walk, social mapping, key informants interview, focus group discussion. Sustainable livelihoods framework of Department for International Development (DFID) was adopted for assessing the sustainable livelihood through LPS. Sustainable livelihoods framework was used in the present study for assessing, selection of factors and indicators vis-a-vis analysis. Participatory techniques were used to delineate the different livestock production systems and the various livelihood options of the tribes. The responses of the respondents were taken against each factor and indicators were scored and analysed for assessing the contribution of LPS towards the sustainable livelihood of the tribal communities.

Selection of Indicators

To bring the values of the selected indicators within the comparable range and also to standardize their values normalization was done (Kumar et al. 2015; Maiti et al. 2015; Feroz et al. 2011; Nelson et al. 2010). Normalization was done by subtracting the minimum value from the observed value and dividing by range using the formula (Kaiser 1958).

$$\text{Normalized Value} = \frac{\text{Observed Value} - \text{Minimum Value}}{\text{Range}}$$

After normalization, the testing of suitability of indicators and elimination of non-significant indicators was carried out using Principal Component Analysis (PCA). PCA was used in earlier studies (Kolenikov et al. 2009; Ravindranath et al. 2011; Maiti et al. 2015). PCA compressed the data by reducing the number of dimensions without much loss of information. After normalization, the covariance matrix was calculated using the formula $(X-X)T(X-X)/m$. Then the eigen values and eigen vectors of covariance matrix were computed and the significance of the factors was found out by Principal Component Analysis (PCA) in Statistical Package for Social Sciences (SPSS version 20) by running the factor analysis for each data set run by choosing PCA for extraction and varimax method for rotation of factors. For the present study cut-off

value of the communality values were decided as 0.60 for the household level and factors were selected accordingly. Factors namely (age, awareness on rights, policies having impact on livelihood, density of social capital at community level, and source of energy) were dropped from the variable list as the communality values were below the cut-off 0.60.

Assigning Weights to the Indicators

After selection of suitable indicators, PCA was run again separately for three major LPS so as to determine the weights by the factor loadings and Eigen vectors were obtained. Kaiser normalisation was used to identify the eigen values greater than one. According to the number of eigen values greater than one, the same numbers of components were extracted by using varimax rotational method for each indicator as shown in rotational component matrix. The method followed by Kolenikov and Angeles (2009), Feroz et al. (2010) and Maiti et al. (2015) were adopted for this study to assign the weights to indicators. Accordingly the initial eigen values above one were identified. Where eigen value was greater than one, the same numbers of rotated components were extracted for each variable as shown in rotational component matrix. Then, the extracted rotated component matrix was multiplied with the 1st extracted component column and 2nd eigen value was multiplied with the 2nd extracted component column, considering only absolute values. The values obtained were added in case of each indicator to get weight for that particular indicator. Likewise, weights were obtained for other livestock production systems.

Radar Diagram for LPS

The pentagon was developed to enable information about people's assets to be presented visually, there by bringing to life important inter-relationships between the various assets. The figure one as in the shape of the pentagon was used to show schematically the variation in people's access to assets. The idea was that the centre point of the pentagon, where the lines meet, represented zero access to assets while the outer perimeter represented maximum access to assets. On this basis different shaped pentagons were drawn for different livestock production systems. In this study, radar diagram was made by the pooling of factors related to livelihood assets to identify the contribution of major LPS towards various capitals of sustainable livelihood. Department for International Development livelihood assets pentagon was made as background and another pentagon was reconstructed for the field conditions of Jharkhand by scoring the livelihood assets and indicators for the respondents and assigning weightage.

RESULTS AND DISCUSSION

Determinants of Sustainable Livelihood in Major LPS

Cattle+Goat- LPS

It is revealed from the Table 1 that Principal Component Analysis was applied for the 19 identified indicators of sustainable livelihood and index values were obtained. Among these indicators, extension contact (5.960), source of energy (5.208) and household assets (5.118) had highest influence on sustainable livelihood of the respondents.

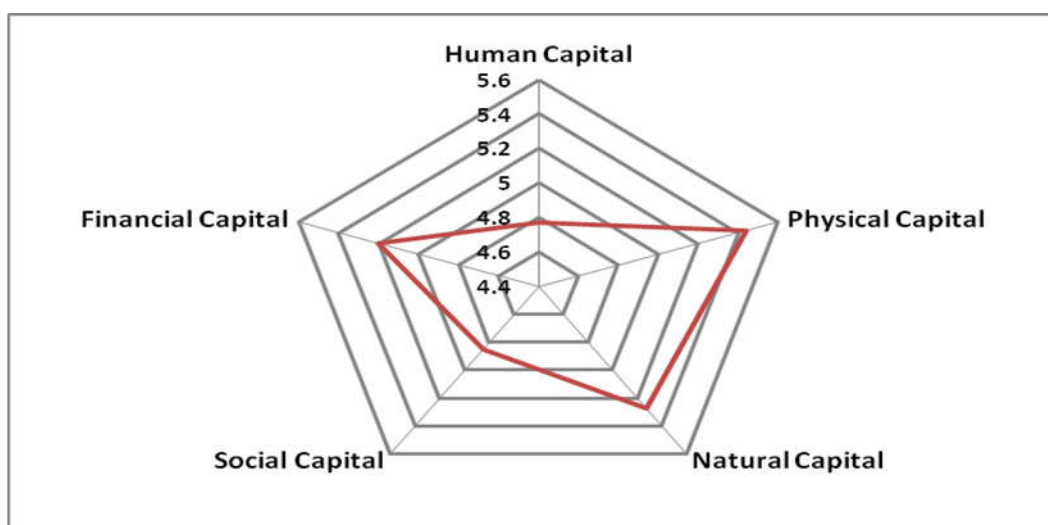


Fig. 1 Reconstructed Sustainable livelihood pentagon for study area

Source: Author

This implies that higher the extension contact of respondents, higher their LPS were inclined towards sustainability, and higher the SL index. The result also depicts that as the energy becomes more renewable and recyclable the sustainability of the production system increases. Energy generated from this system was mainly used for cooking, draught purpose and bullock cart used for travelling purpose. Cow dung was predominantly used for manuring the fields for maintaining soil fertility, and the role of cattle in nutrient cycling is often an important motivation for keeping animals. The present finding confirms the earlier report of Steinfeld *et al.* (2006). It was found that as the household assets increases, the physical capital component increases and the SL index value increases.

Table 1 Determinants of sustainable livelihood in Cattle+Goat- LPS

Variable	1 st Run Factor Analysis (PCA) Communalities		
	Initial	Extraction	Weightage
Education of family members	1.000	0.646	3.697
Health	1.000	0.616	3.432
Employment generation	1.000	0.744	4.708
Use of traditional knowledge in LPS	1.000	0.730	4.512
Access to information	1.000	0.712	4.099
Farm energy	1.000	0.665	3.900
Dwelling place	1.000	0.795	4.610
ICT tools	1.000	0.768	4.510
Source of energy	1.000	0.894	5.208
Household assets	1.000	0.845	5.118
Land improvement activity	1.000	0.871	4.078
Access to natural resources	1.000	0.765	4.703
Security related to natural resource	1.000	0.763	4.843
Social participation	1.000	0.802	4.017
Extension contact	1.000	0.947	5.960
Savings	1.000	0.772	5.078
Debt	1.000	0.668	4.715
Remittance of income by family members	1.000	0.840	4.703
Services received from financial service organisation	1.000	0.809	4.963

Cattle+Goat+Pig - LPS

Table 2 illustrates that Principal Component Analysis was applied for the 19 identified indicators to obtain sustainable livelihood and index values. Among these indicators, education of family members (5.987), use of traditional knowledge in LPS (5.987) farm energy (5.954) ICT tools (5.999), livestock density (6.378) and access to natural resources (6.285) had highest influence on sustainable livelihood of the respondents. In C+G+P- LPS, wide variation was observed in education of family members that is from illiterate to graduate. It is gratifying to note that more educated the respondents were, more they were involved in sustainable LPS. The findings were in line with the finding of previous workers (Prasad *et al.* 2001; Rao *et al.* 2002; Biradar *et al.* 2013). The day to day life of tribes were closely related to the traditional knowledge and natural resources, so as the use of traditional knowledge of tribes and access to natural resources increases, the production system was found to be more sustainable. The result also depicts that as the energy becomes more renewable and recyclable the sustainability of the production system increases. Table 2 also revealed that as livestock density and ICT tools available increases vis-à-vis the physical capital and the sustainable livelihood index also increases. Thus the table throws light to the fact that C+G+P was the most sustainable LPS as the combination of these assets leads to more sustainable livelihood index value. PCA was applied for the 19 identified factors of sustainable livelihood and index values were obtained. Among these factors, use of traditional knowledge in LPS (5.987) farm energy (5.954) ICT tools (5.719), livestock density (5.978) and access to natural resources (5.855) had highest influence on sustainable livelihood of the respondents. Table 3 too revealed that as livestock density and ICT tools availability increases, the physical capital component increases and the sustainable livelihood index also increases. The ICT tools help the farmers to get novel and up to date information on improved management practices of livestock and traditional knowledge reduces the destruction of natural capital and thus together increasing the sustainable livelihood index of the respondents.

Table 2 Determinants of sustainable livelihood in Cattle+Goat+Pig - LPS

Variable	1 st Run Factor Analysis (PCA) Communalities		
	Initial	Extraction	Weightage
Education of family members	1.000	0.814	5.987
Health	1.000	0.736	4.820
Employment generation	1.000	0.791	5.885
Use of traditional knowledge in LPS	1.000	0.814	5.987
Access to information	1.000	0.774	5.654
Farm energy	1.000	0.966	5.954
Dwelling place	1.000	0.801	5.597
ICT tools	1.000	0.928	5.999
Source of energy	1.000	0.840	5.947
Household assets	1.000	0.879	5.597
Land improvement activity	1.000	0.829	5.189
Access to natural resources	1.000	0.950	6.285
Security related to natural resource	1.000	0.674	4.654
Social participation	1.000	0.804	5.855
Extension contact	1.000	0.795	4.990
Savings	1.000	0.866	5.593
Debt	1.000	0.850	5.639
Remittance of income by family members	1.000	0.895	5.716
Services received from financial service organization	1.000	0.789	4.763

Cattle+Buffalo+Goat - LPS

Perusal of data presented in Table 4 shown that C+G+P was the LPS that contributes maximum to the sustainable livelihood of the tribes. Tribal community preferred goat and pig (ILRI 2011) because it is easy for rearing and a major livelihood strategy among rural farmers, especially for small holders (Narmatha et al. 2015). Similar results were obtained in this study in which tribes were found to prefer C+G+P- LPS. It was also found that buffalo and indigenous cattle had poor return compared to goats and pigs and young buffaloes were preferred for beef purpose and the market demand for pig and goat were maximum for social functions and festivals (ILRI 2011; Narmatha et al. 2015).

The study also unveiled that tribes had less preference for buffalo and indigenous cattle. In C+G+P system, management is very easy as inputs are readily available and control of unforeseen difficulties is possible whereas it requires some skill, labour and other resources for C+G and C+B+G which was the main conclusion drawn in focus group discussions. The bird's eye view of the SL index shows that other production systems was found close to C+G+P, this indicates that all the production systems contribute almost similar to the SL of the tribes. Figure one indicated that the SL component human capital was minimum compared to other components, low education level of individual tribes as well as their family, low access to information, low awareness on rights policies and regulations could be possible reasons.

Table 3 Determinants of sustainable livelihood in Cattle+Buffalo+Goat – LPS

Variable	1 st Run Factor Analysis (PCA) Communalities		
	Initial	Extraction	Weightage
Education of family members	1.000	0.822	5.066
Health	1.000	0.702	4.326
Employment generation	1.000	0.777	4.789
Use of traditional knowledge in LPS	1.000	0.899	5.541
Access to information	1.000	0.674	4.154
Farm energy	1.000	0.966	5.954
Dwelling place	1.000	0.801	4.937
ICT tools	1.000	0.928	5.719
Source of energy	1.000	0.840	5.177
Household assets	1.000	0.879	5.417
Land improvement activity	1.000	0.829	5.109
Access to natural resources	1.000	0.950	5.855
Security related to natural resource	1.000	0.674	4.154
Social participation	1.000	0.604	3.722
Extension contact	1.000	0.795	4.900
Savings	1.000	0.866	5.337
Debt	1.000	0.823	5.072
Remittance of income by family members	1.000	0.911	5.615
Services received from financial service organization	1.000	0.773	4.764

Table 4 Index values of Sustainable Livelihood (SL) and its components for major LPS of the study area

LPS	Human capital	Physical capital	Natural capital	Social capital	Financial capital	SL
C+G	4.40	5.31	4.98	5.39	4.53	24.61
C+G+P	5.28	5.70	5.63	5.44	5.47	28.02
C+B+G	4.77	5.44	5.27	4.85	5.20	25.53

CONCLUSION

Analyses of the results pave way to the conclusion that livestock rearing among tribals is their way of life, rather than economic activity. It not only provides financial security in bad times or crisis, but also fulfils their social, cultural and religious needs. However, other livelihood options also play a vital role in the livelihoods of tribal people. Although the major LPS are C+G, C+G+P, C+B+G, C+B+G+Poultry, C+B+G+P, C+B+G+P+Poultry, all are found to be substantially contributing for the sustainable livelihood and are the integral part of day-to-day livelihood activities and traditional life style for aboriginal people in the area. Therefore, the livelihoods promotion among tribal people needs a paradigm shift focusing on LPS to keep pace with sustainable development and future challenges in the area. There is enormous scope for enhancement of sustainable livelihoods for tribal population through LPS, domestication of more animals, organized marketing system, proper refinement and dissemination of indigenous technologies, institutional support in training and skill development, appropriate extension and communication networks. The interventions visualized needs to be implemented efficiently for all-round development of the tribal people and for ecological stability in the study area.

Recommendations

The prospective of livestock based livelihood involvements projected for development of tribal communities remained

largely untapped due to lack of appropriate policy, institutional framework, extension and communication, training, capacity building, skill upgradation, technology refinement, value addition, marketing infrastructure and financial assistance. Further, the livestock based livelihood interventions commensurate to the way of tribal life. Therefore, the Central or State Governmental as well as Non-Governmental Organizations should implement the proposed livestock based livelihood interventions through their developmental schemes for sustainable development and poverty alleviation of the indigenous people in the area.

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