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Livestock diversity in shifting cultivation area of North Eastern Hill states in India

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Livestock are used by humans to provide a wide range of products and services. Foods derived from animals are important sources of nutrients (Givens 2010) that provide a critical supplement and diversity to staple plant-based diets (Murphey and Allen 2003, Randolph *et al*. 2007). More than 90% population of the North Eastern Hill Region (NEHR) of India is non vegetarian. However, livestock are also kept for providing manure, fibre and leather for clothes and resources for temporary and permanent shelter, producing power as draught animal, serving as financial instruments and enhancing social status. This range of products and services support livelihood especially of the poor marginal farmers. In some tribal societies of the NEHR of India, a man used to be considered as resourceful as the quality and quantity of his livestock he had in his life. The diversity of breeds is closely related to the diversity of production systems and cultures. Local non-descript breeds are usually reared in grassland-based pastoral and small-scale mixed crop–livestock systems with low to medium use of external inputs. Over the past decades, agriculture has achieved substantial increase in food production, but accompanied by loss of biodiversity, including animal genetic resources, and degradation of ecosystems, particularly with respect to their regulating and supporting services (MEA 2005). *The State of the World's Animal Genetic Resources for Food and Agriculture* (FAO 2007) describes the link between livestock biodiversity and food security.

Livestock are integral part of rural life of North Eastern Region (NER) of India. Cattle and pig are two important animals domesticated by many communities in the region. On an average 57% household in NER possess livestock against the national average of 56%. Cattle and buffalo are used for agricultural land preparation through tilling of soil as well as source of milk. They supply manure in the form of dung not only to crop land but also to other rural ecosystems. Moreover, it forms a part of cultural practices. Similarly, pig rearing is most common in all the states due to high demand for pig meat within the tribal people of the NER and its close association with cultural system of many tribes inhabiting the region. North East India possesses a significant numbers of pig populations in the country accounting for 28% of the total pig population of India (NEIDA 2017). As per 19thLivestock Census (2012) livestock population of indigenous breed of cattle, pig and sheep are significantly high in Arunachal Pradesh, Assam, Manipur, Meghalaya and Tripura. All these animals are integral part of the agricultural system of the region and also considered as liquid assets by many communities.

The area under shifting cultivation in Northeast India is nearly 19.91 lakh ha and it accounts for 83.73% of the total shifting cultivation area in India (GoI 2000, Mandal 2011, NRCS 2011). On an average, estimated 38.69 thousand ha area is set under *jhum* every year and 443,336 tribal families earn their livelihood from such practice (Tripathi and Barik 2003). Annual area under *jhum* in North-Eastern states of India is 386×10^3 ha while total affected area is 1.46 m ha with shifting cycle from 3 to 7 years and the number of families involved in the practice in the region are 0.44 million (Silva *et al*. 2011). *Jhum* is an Assamese term used commonly in North east India. Tribal people involved in this practice are known as "*Jhumias*" (Choudhury 2004). Though the NER is predominantly dependent on cultivation of crops, animal husbandry is an inseparable part of the farmers' economy and it supplements the livelihood of all categories in the NER. Animal husbandry is a secured source of livelihood for the tribal. But, the return is low due to lack of knowledge of modern animal husbandry practices, besides unawareness about marketing opportunities. There is paucity of literature on animal husbandry practices, livestock diversification and factors influencing livestock rearing among *jhumias* of NER which are basic need for application of scientific livestock interventions in the region. Therefore, the present study was conducted for an intensive appraisal of the animal husbandry practices livestock diversification and factors influencing livestock rearing

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among *jhumia* communities of North Eastern Hill states of India.

The present study was conducted during year 2016–17. Out of total 8 states of the region, 6 north eastern hill states included in the study were Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. From each state, one district enlisted under Backward Regions Grant Fund (Anonymous 2014) and having the highest density of tribal families was purposively selected for the study. From Upper Subansiri (Arunachal Pradesh), Churachandpur (Manipur), West Garo Hills (Meghalaya) and Mon (Nagaland) a sample of 100 tribals practicing shifting cultivation from each of the selected district were randomly sampled. Whereas, from Saiha (Mizoram) and Dhalai (Tripura) a sample of 50 tribal from each districts were selected randomly for the study. Thus the total sample drawn for the present investigation was 500. Focus Group discussion, key informant interview and direct observation were also applied to triangulate the responses received from respondents. Livestock diversity was studied using Simpson index (1949) as it is one of the widely used indices (Yeom and Kim 2011). Livestock diversity was calculated using following formula of SDI:

$$D=1-\frac{\sum n\,(n-1)}{N\,(N-1)}$$

where, n, number of individuals of each species; N, total number of individuals of all species.

Constraints faced by *jhumias* in livestock rearing was measured using the 3 point Likert scale (1-not a constraint, 2-least constraint and 3-major constraint). Primary data were collected from the respondents through a pre-tested interview schedule.

Livestock possession among the jhumia of NEH region: Jhumias of all the NEH states reared poultry and piggery however, in case backyard poultry the maximum percentage (89%) was found in West Garo Hills, Meghalaya and the minimum percentage (37%) was found among the *jhumia* of Mon, Nagaland (Table 1). Pig rearing was the highest (84%) in Saiha, Mizoram and the lowest (25%) was in Mon, Nagaland. Rearing of cow by the *jhumia* was reported from 3 states and that too was concentrated in West Garo Hills, Meghalaya and Churachandpur Manipur. Goat, fishery and buffalo rearing was observed in twin states only. Whereas mithun (*Bos frontalis*) was mainly found in the state of Arunachal Pradesh and 45% *jhumias* reported its possession in the state. Mithun is regarded as a sacred semi-domesticated animal in the socio-economic life of the *Adi* tribes of Arunachal Pradesh (Apum and Nimasow 2015). Wild boar (*Susscro facristatus*) was another animal reported from Dhalai, Tripura only.

Through focused group discussion it was found that the type of animals and birds reared were mostly indigenous non-descript breeds and the method of rearing was traditional as backyard farming. Only few crossbred pig populations were observed. Thus, the productivity of the livestock and poultry reared by the farm families was low

Table 1. Distribution of respondents according to livestock possession

Sample area Livestock	Upper subansiri	Churachandpur	West garo hills	Saiha	Mon	Dhalai
Poultry	64.00	47.00	89.00	86.00	37.00	46.00
Pig	50.00	40.00	45.00	84.00	25.00	76.00
Cow	10.00	23.00	49.00	–	–	–
Goat	–	–	19.00	12.00	–	–
Fishery	–	–	–	12.00	–	26.00
Buffalo	–	07.00		12.00	–	
Mithun	45.00	–	–	–	–	–
Wild boar	–	–	–	–	–	14.00

attributed to indigenous non-descript breeds, imbalanced feeding, lack of scientific farming and traditional method of rearing. The tribal people of the region highly value mithun species not only as a pride object of sacrifice but also for their use in barter trade. Though primarily used for meat purposes, mithun has great potential for quality milk and leather production and there is a great scope to promote this animal as an organic meat and milk producer (Anonymous 2012). There has been persistent demand from the North Eastern states seeking support for the all-round development of pigs. Therefore, the pig development is being implemented as a sub-mission of the National Livestock Mission (NLM). The sub-mission strives to forge synergies of research and development organizations through appropriate interventions, as required for holistic development of pigs in the North Eastern Region, including genetic improvement and health cover (GoI 2016).

Livestock diversification index (SDI) at Jhumia *household level:* Livestock diversity is an aspect of biodiversity and is important for livelihood and nutritional security. Livestock maintains balanced ecological mosaics through browsing, grazing, nutrient cycling, and the dispersal of seeds (FAO 2016). The loss of biodiversity is considered one of today's most serious environmental concerns by the Food and Agriculture Organization. The livestock diversification index worked out using the *jhumia* household level information and it was 0.69 (Churachandpur and West Garo hills), 0.66 (Saiha) and 0.63 (Mon).

At the aggregate level, the livestock in the sampled states seems to be moderately diversified. The diversification index value was found to be 0.67 for the North Eastern Hill Region as a whole at *jhumia* household. It varied from 0.62 for Dhalai, Tripura to 0.70 for Upper Subansiri, Arunachal Pradesh which indicated that animal rearing is the most diversified in Arunachal Pradesh and least diversified in Tripura. State initiative of using rubber plantations as a means for rehabilitation of landless tribal shifting cultivators may be one of the reasons for a lower value of diversification index of livestock in Tripura. Nath *et al*. (2010) reported that the rubber plantations might have increased forest coverage, but at the cost of local biodiversity in Tripura.

Among several impediments, poor infrastructural

facility, viz. lack of transport and subsidy for the products (Mean score, 2.55) emerged as one of the most important constraints that hinders the different options of livelihood diversification followed by lack of access road (MS 2.48) and remunerative price of the produce (2.45). Again lack of access to veterinary extension services (2.35) and unavailability of credit due to common property resources (2.34) were other important impediments as perceived by the respondents towards diversification of tribal livelihood. It may be worthy to mention here that the Backward Regions Grant Fund Programme (BRGF), launched in 2007, signifies a new approach to addressing persistent regional imbalances in development however, level of people's awareness about the programme was low and overall amount of grants is too small to meet the infrastructural deficits of the backward regions (GoI 2014). In addition, mountain people, particularly in the Hind-Kush Himalayan region, are highly vulnerable to food insecurity because of their low productivity, subsistence economies, constraints of terrain and climate, poor infrastructure, limited access to markets, physical isolation, vulnerability to natural hazards and high cost of food production and transportation (Rasul 2011, Tiwari and Joshi 2012). Access to markets is critical to speed up commercialization of livestock production and it may act as a disincentive to farmers to adopt improved technologies and quality inputs (GoI 2012).

SUMMARY

The breed of animals and birds reared by the *jhumia* were mostly non-descript and the method of rearing was traditional or backyard farming. Local breeds are an important self-replicating asset of almost all *jhumia* people and fulfill functions that go far beyond the output of products. At one end of the spectrum are breeding and production systems in which animals are kept in natural environments and are exposed to a large degree of natural selections imposed by the elements. Such systems are prevalent in ecologically marginal areas and typically practiced by pastoralists for whom adaptation traits are more crucial than production traits. Considering the distinctive features of animal genetic resources, as well as the urgent need for maintaining and conserving domestic animal diversity for future generations, it is necessary to promote more productive and sustainable livestock management.

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REFERENCES

Anonymous. 2012. Report of the Working Group on Animal Husbandry & Dairying. 12th Five Year Plan (2012–17) http://planningcommission.gov.in/aboutus/committee/wrkgrp12/agri/AHD_REPORT_Final_rev.pdffor%202421.pdf.

Anonymous. 2014. List of 272 BRGF including 22 new districts. http://www. panchayat.gov.in/documents/10198/562728/Annexure%20for%202421.pdf.

Apum Nayo and Nimasow Gibji. 2015. Socio-economic importance of Mithun (*Bos frontalis*) among the *Adi* Tribes of Arunachal Pradesh, India. *Science and Culture* **81** (7–8): 200–05.

Choudhury A. 2004. Human–Elephant Conflicts in Northeast India. *Human Dimensions of Wildlife* **9**: 261–70.

Dong-June Yeom and Ji Hong Kim. 2011. Comparative evaluation of species diversity indices in the natural deciduous forest of Mt. Jeombong. *Forest Science and Technology* **7**(2): 68–74.

FAO. 2007. *The State of the World's Animal Genetic Resources for Food and Agriculture*. (Eds) Rischkowsky B and Pilling D. Rome, Italy: Food and Agriculture Organization of the United Nations.

FAO. 2016. *Sustainable Agriculture for Biodiversity*. http://www.fao.org/3/a-i6602e.pdf

Givens D I. 2010. Milk and meat in our diet good or bad for health? *Animal* **4**(12): 1941–52.

Government of India. 2000. *Guidelines for watershed development project in shifting cultivation areas*. Ministry of Agriculture, New Delhi.

Government of India. 2014. *Evaluation Study of Backward Regions Grant Fund* (BRGF), PEO Report No. 223, Planning Commission, Programme evaluation organisation, Government of India, New Delhi.

Government of India. 2016. *State of Indian Agriculture 2015–16*, Ministry of agriculture and farmers welfare. Department of agriculture, cooperation and farmers welfare. Directorate of Economics and Statistics, New Delhi.

Mandal R K. 2011. Changing agricultural scenario and its impact on food habit in north east states of India. *Food Biology* **1**: 27–36.

MEA. 2005. Millennium Ecosystem Assessment (MEA), *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute, Washington DC.

Murphey S P and Allen L H. 2003. Nutritional importance of animal source foods. *Journal of Nutrition* **133**(11): 3932–35.

Nath T K, Inoue M and De Zoysa M. 2010. Rubber planting for forest rehabilitation and enhancement of commercial livelihood: a comparative study in three south Asian countries. In: 18th Commonwealth Forestry Conference, Edinburgh.

NEIDA. 2017. http://neida.org.in/focus/livestock.

NRSC. 2011. Wasteland atlas of India. Department of land resources. National remote sensing centre. dolr.nic.in/dolr/wasteland_atlas.asp.

Randolph T F, Schelling E, Grace D, Nivholson C F, Leroy J L, Cole D C, Demment M W, Omore A, Zinsstag J and Ruel M. 2007. The role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of Animal Science* **85**: 2788–800.

Rasul G and Thapa G B. 2003. Shifting cultivation in the mountains of South and Southeast Asia: Regional patterns and factors influencing the change. *Land Degradation and Development* **14**: 495–508.

Silva J M N, Carreiras J M B, Rosa I and Pereira J M C. 2011. Greenhouse gas emissions from shifting cultivation in the tropics, including uncertainty and sensitivity analysis. *Journal of Geophysical Research* **116**: 1–21.

Simpson E H. 1949. Measurement of diversity. *Nature* **163**: 688.

Tiwari P C and Joshi B. 2012. Natural and socio-economic factors affecting food security in the Himalayas. *Food Science* **4**(2): 195–207.

Tripathi R S and Barik S K. 2003. Shifting Cultivation in North East India. Proc. Approaches for increasingagricultural productivity in hill und mountain ecosystem. ICAR Research Complex for NEH region, Umiam, Meghalaya, India.