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## Indigenous knowledge of agriculture and animal husbandry practiced by monpa tribes of tawang Arunachal Pradesh

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### Abstract

The indigenous knowledge (IK) tuned to local culture, social organization, need based, tested over centuries and dynamic in nature allow the local people to adapt to social and ecological attributes, thus contributing to food security and overall enhancement of the sustainability of natural resources. The research was conducted during 2016-2017, purposively on local tribe community, randomly 15 selected villages of Three Blocks Viz; Tawang, Jang and Lumla in district Tawang Arunachal Pradesh. 08 respondent were randomly selected from each village (total 120) list provided by the Village Extension Workers, Participatory rural appraisal (PRA) and personal interview methods were applied to collect the data on Knowledge of agriculture and livestock rearing and management. Result revealed that traditions maintained by various cultural and social institutions of Monpa community are having strong ethical base while harvesting the plants and animals, and deciding the consumption pattern of foods. There is urgent need for awareness programmes on importance of local livelihood support crops and to involve them in food biodiversity based natural resource conservation for sustainable management of local livestock and agricultural crops, bioresources for rural livelihood security.

**Keywords:** Indigenous technical knowledge; agriculture; livestock; farmers

### Introduction

Such indigenous knowledge is not only economically viable but also locally feasible. Indigenous knowledge is diminishing at an alarming rate with ageing of those in the indigenous population with strong links to the past (Maundu 1995) [2]. The quantity and quality of IK varies among community members, depending upon gender, age, social status, intellectual capability, profession and degree of connectivity with surrounding natural resources (Berkes *et al.* 2000, Sarah, L 2002; Turner & Earths 2005) [1, 7, 16]. Dynamic and sophisticated rural livelihoods usually believe plant, animal and ecosystems' diversity (Thresher, 1992) [15], both wild and in several stages of domestication. Different types of biodiversity and natural resources conserved and used by different people at different times and in different places, contribute to the sustainable livelihood strategies in a complex fashion. In addition to contributing to environmental sustainability, agricultural biodiversity saved by local people helps to sustain many production functions both in low external input and high input-output agriculture (Pimbert, 1999 and UNEP-CBD, 1999) [5, 17]. North eastern states of India, particularly Arunachal Pradesh is known to be one of the rich sources of biodiversity. The tribal population in Arunachal Pradesh is largely dependent on agriculture and animal husbandry as a main source of their livelihood and these tribal farmers are known to have rich knowledge of indigenous technology pertaining to agriculture, pest management, crop biodiversity conservation and ethno veterinary practices (Rakesh, E.S. 2014) [6]. Conservation of biodiversity and other natural resources in Arunachal Pradesh over a long period of time has been possible because of the cultural, spiritual and other social institutions of diverse tribal people that have guided the relationships between local communities and their resources (Singh and Sureja 2006 a,b,c). In this context to known the livelihood pattern, cognition of resource perception and Traditional Knowledge System in relation to agriculture and livestock of Monpa tribe.

### Methodology

The Monpa tribe of Arunachal Pradesh inhabits at higher altitude ranging between 3,500 and 22,500 feet from mean sea level in Tawang District. The present study was conducted in

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district Tawang Arunachal Pradesh during 2016-2017; three blocks were Tawang, Jang and Lumla. Purposively 15 Villages were randomly selected viz; Tawang block; Changbu, Kitpi, Kinmey, Seru and Surbi under Jang block; Lhou, Jang, Kharsa, Namazing and Jangda under Lumla block; Gispu, Kharteng, Lumla, Kungba and Namtsering. In each village 8 respondent were selected randomly Surveyed (total 120) list provided by the Village Extension Workers and personally interviewing with questionnaire developed Informed consent has been obtained from the Gaon Burha (Gram Pradhan) for sharing and publishing their knowledge system to acknowledge them formally to know the information regarding Knowledge of agriculture and livestock rearing and other management practices followed by local tribes. Secondary information was obtained from central and district offices, professional researchers and officials to cross-check the primary data (Sedhain, 1993) [8]. Moreover, the literatures, reports and documents related to this study are reviewed as the references to testify the information we obtained and collected.

## Result and discussion

### Indigenous knowledge regarding agriculture

Agriculture is the main occupation of the people of Tawang on which the economy of the district almost entirely depends. The local agricultural land is categorized in three broad categories i.e. top hill agriculture, middle hill agriculture and foothill agriculture. A greater part of their agricultural land is under permanent cultivation, though shifting cultivation is practiced in some pockets. Total grossed crop area of the district is 5314 ha. Monpas are adapting terrace cultivation-both wet and dry. Accordingly, indigenous maize namely Fenthina (dwarf variety, duration 3 months), Thinasheru (tall variety, duration 5 months) and Baklangboo [medium tall variety, sown for the festival of Lohsar [January to February], duration 4 months]. The most popular use for maize is in the preparation of local beer (Cchang), which is used to cure many human and animal diseases. Paddy crops are grown in foothills, while finger millet is planted in the middle hills and wheat and barley are grown in top portions of the hill. Hence, the decision on the use of available local resources is made by the community and not by the individual. Skills developed over centuries by tribal are suited to the particular environment and ecosystem in which they live and operate the agricultural practices. The women have a range of diversified gene banks of indigenous varieties of wheat, barley (Bong, with or without awns), *Phaphda teeta* (buckwheat), *Phaphda meetha* (buckwheat), paddy (*Sungsungbara*), finger millet (*mandua*), Indian bean (*Lab-lab purpureus*), rajmabeen (*Phaseolus vulgaris*), millet (*Bundagmo*, *Panicum psilopodium* var. *psilopodium*), coriander (*Ush*), bottle gourd (*Lau*), cucumber (*Manthong*), soybean (*Lee*), pumpkin (*Broomsa peela*, *Broomsa saphed*, *Cucurbita moschata*), bitter gourd (*Kaibandu*), spinach (*Taktak*), field pea, mustard species (*Lai Saag*, varieties *Leme* and *Penche*, *Brassica* spp), garlic (*Lamm*), *Mann bada* (*Allium* spp.), *Mann Chhota* (*Allium* spp.), onion (*Chong*), millet (*Moo*, *Panicum psilopodium* var. *coloradum*) and chilli (*Solu*) and varieties of maize (*Fenthina*, *Thinasheru* and *Baklangboo*). Many spices, like star anise (small and big varieties), timbur (prickly ash, *Zanthoxylum armatum*) and corn pepper are commercially available from local markets and are sold by women these are rich source of income (Singh *et al.* 2007<sup>a, b</sup>) [9]. Monpa tribe had mastered the method of preparation of a range of food items and beverages. These food items include Thukpa, Momos, Khura, Zan, Puta, Khazi, Bresi, Khapse, Chhurpi etc. which are prepared with the help of crops like rice, wheat, maize, barley, finger millet, buckwheat, vegetables and yak

meat as well as milk. The beverages locally known as Singchang, Baang-chang, Aarak, Marchang, Monpa tea etc. were prepared from fermentation, distillation and brewing of food grains (Pandey, *et al.* 2017) [4]. Performing the rituals, worship and customs of Buddhist religion implies that the people have to conserve more than eight varieties (of three species) of local pine. For the domestication of local tree species, Lamas (priests) issue a notice to collect the seedlings and cuttings from forests on a particular day and time. The Buddhist religion plays a pivotal role, even during different agricultural operations. For instance, before harvesting the local maize, special religious permission need to be taken from the village Lama. If this is not done the people believe that the subsequent crops will suffer from many diseases.

### Indigenous knowledge regarding horticulture crops

Tawang is known for terraced cultivation and production of Kufri Jyoti variety of Potato is very popular. Numbers of horticultural crops are also being taken up in a big way in recent years. The progressive cultivators of this district reap a good harvest of Cash Crops like Apple, Kiwi, Walnut, Orange, Plum, Peach, Cole crop Cabbage, Tomato, Turnip, Potato and other leafy vegetable etc., Major Spice and condiments grown are Chilli, Turmeric, Ginger, Garlic and other spices derive considerable financial benefits out of the cash crops produced by them every year. Kitchen gardens play a vital role for food and nutritional security of monpa tribes for providing vegetables, medicinal, spices & condiments and fruit trees in their daily life. Annual crops, for example like maize, beans, chillies and amaranths are grown as intercrop and mixed crop in the Kitchen gardens where there are perennial fruit trees. These fruit trees provide support to the vines of beans and cowpea. Kitchen gardens provide easy access (particularly during the rainy seasons) to a variety of resources the communities need regularly, such as food, fuel wood, fodder and medicines. In Tawang, plum, apple and peach trees, grown in kitchen gardens of poor people, were cited as major sources of income. Radish and *Lai patta* (*Brassica* spp.) growing in home gardens add up to the stock relied on by communities for income and general livelihood security. Some farmers are skilled at grafting fruit trees, even grafting different species on one tree. For instance, combinations of apples and pears and of peaches and apple can be found. Recently deforestation, soil erosion and fertility decline problems have become severe as the fallow period is decreased upto 7-8 years. This is the result of pressures by ever mounting population on the land and the local fruit crops (apple, peach, plum, kiwi fruit, etc.). There is insufficient time for the replacement of soil fertility through natural processes. Due to frequent changing of site of whole ecosystem, shifting cultivation is largely responsible for deposition of silt in the rivers of adjoining areas and there is a continuous regression of valuable forest species. Non-woody forest species commonly used for direct consumption and income generation include vegetables, mushroom, medicinal plants, roots and tubers. Mushroom is the major source of protein for members of the Monpa tribe in areas where there are no other types of protein available in the form of meat.

### Indigenous knowledge regarding Animal Husbandry practices

The climatic condition of the district is moderate and pleasant during the summer and extreme chill and biting cold during the winter, so that livestock production is very hard to the farmer. Population allocation of livestock species in district mainly cattle, crossbred, hilly breed, Mithun, Goat, Sheep, Yak, Pig, Poultry, Horse, Ponies and other Species. Mithun is mainly reared for meat which is considered to be more tender

and superior over the meat of any other species. Mithun milk, though produced less in quantity, is of high quality and can be used for preparation of various milk products. Besides, this animal is also used as marriage gift and sacrificial animal for different social and cultural ceremonies (Mondal *et al.* 2014)<sup>[3]</sup>. Yaks are important in the higher elevations. Sheep husbandry also popular among the Monpa Community. Some groups also raise fish in river and their tributaries through aquaculture. The land selected for community grazing should be of slight slope to avoid soil erosion and sustain natural vegetation. Dung and urine of sheep are utilized by local farmers to fertilize and enrich the soil. Fertility of the land thus depends partially on the number of sheeps available. As a rule for resource management the Brokpa uses some part of his earnings on making the soil fertile. For a desired piece of area, a temporary bamboo or wooden fencing is erected and during night, sheep herding (Terske) is arranged. A hut called Brokbrang, locally constructed of stones and wood, is used as the residence during grazing. Preference is given for sheep herding in the top parts of the hills, because here barley, wheat and some temperate vegetables like Mann (*Allium sp.*), Laipatta (*Brassica spp.*), local potato, onion, etc. are grown, where carrying and transportation of organic manure is difficult. Dum (wool) is only made from local breed of sheep are not used for weaving sweaters, but instead for other cloths like trousers, shirts and caps. It is also the best source of income for empowering the Monpa women. The grazing lands are selected near the available local water resources (Nala, small and large rivers, as well as ponds and fountains) where the soil is light black in color with high percentages of clay, full of vegetation for the grazing of sheep, goats, cows, horses and yak. In tradition Brokpas are responsible for supplying milk products and meat of yak to different villages after the months of summer grazing. The females are responsible for the domestic work and making ethnic foods for the males. The Buddhist religion restricts the member of Monpa tribe not to plug the bamboo shoot at an early stage for

consumption. The dynamics of the ecosystem and food security has forced them to use bamboo leaves as the fodder for their yak and Dzomo. When ice-freezes cover with the grasses during winter season, local yaks are allowed to scratch the ice and graze. Yak grazes in open areas that aren't fenced, grazing yaks are called by herders by whistling or singing. In the Night yaks are delivered to the shed for cover from wild animals and for milking. In summer season yaks are left free for grazing early and brought late to the shed but during the winter season yaks leave late and brought back early. Feed intake of Yak is a smaller amount than other cattle, probably due to their smaller rumen capacity. The yak and Dzomo breeds are reared during the calving period under the prevailing local grazing and forest conditions (Singh and Brokpa Community 2009)<sup>[11]</sup>. After calving, the yak is fed with a mix of common salt and flour of ragi, barley and maize. It helps in recovering the pain after calf delivery and increases the milk yield. The yak feeds on palatable shrubs like *Kobresia napalensis* ("sun buki"), *Kobresia capillifolia* ("kesari buki"), *Carex nivalis* ("dharkhare"), *Phleum alpinum* ("doodhe jharr"), *Festuca valesiaca* ("rani buki"), *Kobresia duthiei* ("bhalu buki"), *Juncus sp.* ("suire buki"), *Allium prattii* ("dandu"), *Heracleum sp.* ("ganer"), *Selinum tenuifolium* ("cheeru"), *Rheum acuminatum* ("khokim") and *Carex nigra* ("harkat"), during the summer season. For the grazing of yak, sheep, goats and other animals, a specific date is set by the people of a hamlet to avoid conflict and instead attempt to sustain the available forage and grass. Brokpa use pasture of people by paying different sort of grazing fees. Beyond which if someone is accessing the pasture more, then he's fined by the Goan Burha. The grazing grounds are mostly belonged to the community, clan, individual and monastery. Monpa Tribes are curing different diseases and disorders by using ethno veterinary medicines by their informal experimentation, location specific observations and locally available medicinal plants.

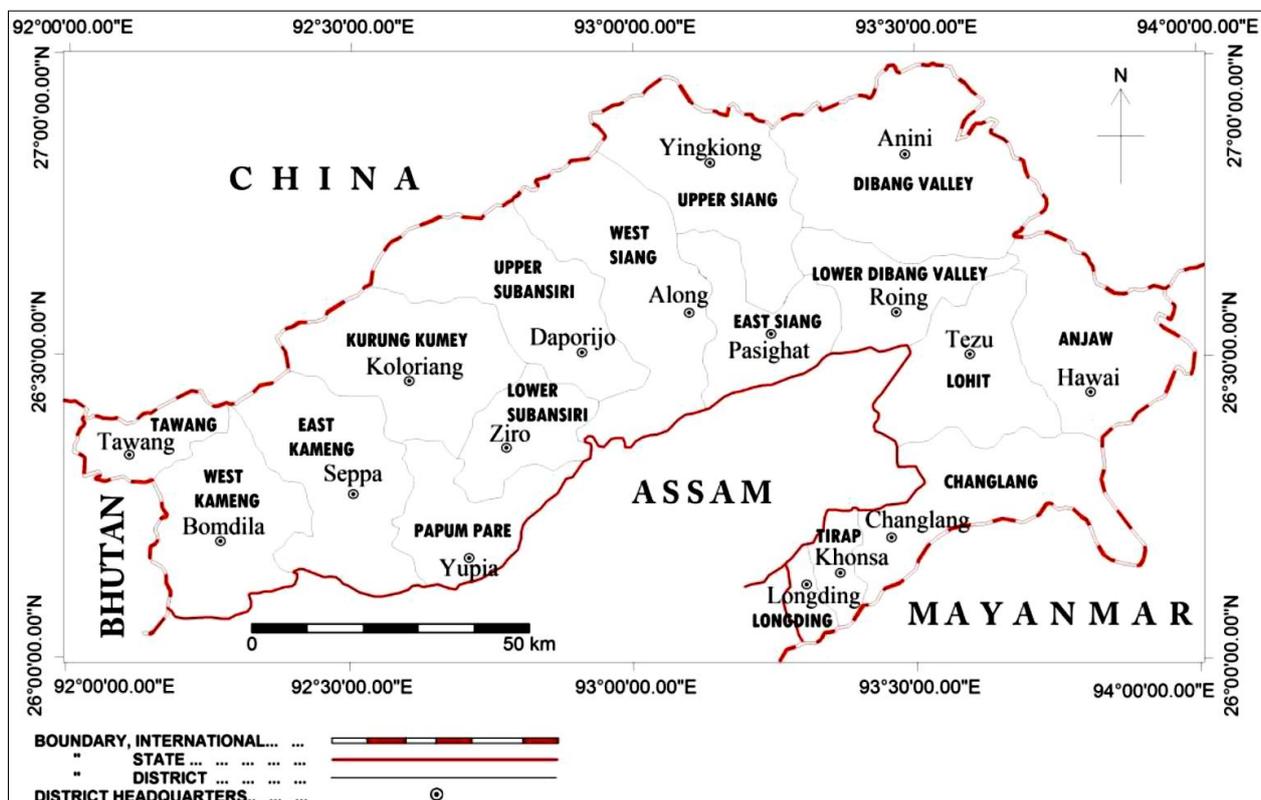


Fig 1: Map of Arunachal Pradesh Showing Study Sites -Tawang

**Table 1:** Use of traditional crops, part used in foods

Species	Local Name	Botanical Name	Part Use in food	Season of Availability	Conservation mode
Barley	Nai	<i>Hordeum vulgare</i>	Grain	May - June	Shifting land and home garden
Finger millets	Comp	<i>Eleusine coracana</i>	Grain	November	Shifting land
Wheat	Ko, Nass	<i>Triticum astivum</i>	Grain	May - June	Shifting land and home garden
Buck wheat	Brame	<i>Fagopyrum esculentum</i> Moench	Immature grain use for Tem (Vegetable), Mature grain use for Phe (Atta)	April- May	Shifting land, home garden and community forest
Rice	Debh, Nu	<i>Oryza sativa</i>	Grain	October - November	Shifting land
Maize	Ashom	<i>Zea Mays</i>	Immature and mature grain	July to October	Shifting land and home garden
Cabbage	Rupong, Pongru	<i>Brassica oleracea var. capitata</i>	Leaf	Round year	Shifting land and home garden
Local Spanich	Patse	<i>Spinacia leracia</i>	Leaf	April to October	Domesticated in home garden
Radish	Ker	<i>Raphanus sativa</i>	root	Round year	Domesticated in home garden
Bitter gourd	Khau Bando, Ru, Kho Kairy	<i>Momordica charantia</i>	Fruit	July to October	Shifting land and home garden
Pumpkin	Brumsa	<i>Cucurbita moschata</i>	Fruit, Tender leaf	July to September	Shifting land and home garden
Onion	Tshong	<i>Allium cepa</i>	Leaf, Bulb	January	Shifting land and home garden
Garlic	chhet	<i>Allium sativum</i>	Leaf, Bulb	August	Shifting land and home garden
Lettuce	Notch Ru	<i>Lactuca sativa</i>	Leaf	April to October	Shifting land and home garden
Layi Patta	Petsa Ru	<i>Brassicca spp.</i>	Leaf	Whole year	Domesticated in home garden
Local chillies	Solu	<i>Capsicum frutescence</i>	fruit	July to September	Domesticated in home garden
Man patta	Man	<i>Allium spp.</i>	Leaf	April to July	Shifting land, home garden and community forest
Local Mushroom	Moo	<i>Agaricus Spp.</i>	Whole plant	April to July	Community forest
Soya bean	Kya grap	<i>Glycine max</i> Merrill	Grain	October	Shifting land

## Conclusion

Extinction of traditional knowledge has been witnessed. There is a threat of declining age-old traditional knowledge in this region. Being the global tourist hotspot, rapid climate changes and developmental process have been seen in Tawang. Varying culture with the changing altitude of ecology of even same community determine types of access and ways of conservation of plants and animals used in ethnic food system. The traditions maintained by various cultural and social institutions of Monpa community are having strong ethical base while harvesting the plants and animals, and deciding the consumption pattern of foods. There is urgent need for awareness programmes on importance of local livelihood support crops and to involve them in food biodiversity based natural resource conservation for sustainable management of local livestock and agricultural crops, bioresources for rural livelihood security. Hence, for enhancing the sustainability of existing natural resources, a comprehensive participatory approach to be followed by policy makers and NGOs, local tribal community more self-reliant and responsible towards development of pastoral economies is that the key to poverty alleviation.

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