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Change in migration and pasture utilization by Brokpa pastoral nomads: A sustainable adaptation strategy for climate sensitive Arunachal Pradesh!?

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Introduction

The north-eastern states of India specially Arunachal Pradesh, one of the bio-diversity hotspot, is expected to be greatly affected by climate change. Climate change will not only adversely impact the biodiversity of Arunachal Pradesh, but also affect the livelihood of local communities as they fully dependent on the natural resources. The *Monpa* is a primitive tribe inhabiting parts of West Kameng and Tawang district of Arunachal Pradesh. The pastoral nomad of the *Monpa* tribe is popularly known as *Brokpa*. Transhumance system of livestock mainly yak (*Poephagus grunniens* L.) rearing is their main source of livelihood. In recent past, challenges of the *Brokpa* pastoral community transform into threat due to synergistic effect of impending climate change. But, this nomad has their own mechanism to cope up with adverse impact of climate change. Therefore, a systematic study was carried out to document and analyze these coping mechanisms.

Materials and Methods

Highlands of the West Kameng and Tawang districts are commonly known as yak tracts and the present study was confined mainly in these highlands. A total six villages *i.e.*, Nyukmadung, Lubrang, Senge, Mandla-Phudung, Dirnang Basti and Chhander were selected purposively from West Kameng district; and another six villages *i.e.*, Jangda, Shyro, Rho, Mirba, Mukto and Sherjong were selected from Tawang district. The *Brokpa* who had more than 30 years of experience in livestock rearing of at least one species among cattle, yak, Mithun, goat, sheep and pig; and having main income from livestock was considered as respondents for the present study. Subsequently, 148 respondents were selected, purposively, from 12 selected villages and they were interviewed with the help of local leader like *Gaon Burha* (village headman). Village wise Focused group discussion (FGD) was also carried out during data collection.

Adaptation strategies was operationalized for the present study as the measures adapted and/or followed by the *Brokpa* pastoral nomads to cope up with the adverse impact of climate change on livestock rearing and/or their livelihood for sustainable livestock productivity and/or sustainable livelihood security. An exclusive 'Climate change adaptation index (CCAI)' was developed by following Maiti *et al.*, (2014) to quantify the adaptation strategies. Adaptation strategies with higher index value indicated higher coping capacity and ranks were given accordingly.

Results and Discussion

Change in migration and pasture utilization as adaptation strategy by Brokpa pastoral nomads: In Focused Group Discussion (FGD), it was emerged that traditional yak husbandry involves migration in search of congenial environment & better pasture. Therefore, all the *Brokpa* of a particular village meet at a pre-fixed place during the *Losar* festival or second week of February to discuss about the distribution of grazing routes for that particular year and the date of movement. *Brokpas* used to divide a year into four parts *viz.*, spring, summer, autumn and winter. During the summer (May to September) they stayed at alpine pasture at an altitude of 3,000 to 4000 meter above mean sea level (MSL).

It was also emerged from the same Focused Group Discussion (FGD) that there were some changes in their migration as well as pasture utilization during last 10-15 years and these changes are depicted in Table 1. They revealed that during last 10-15 years, winter had shortened and temperature during the middle of March is not at all congenial for yak. Therefore, they were forced to start upward migration during the last week of February to middle of March instead of May-June as like 10-15 years back. They also reported that in recent year cycle of migration used to complete during the month of December, but, 10-15 yrs back it was in the month of November. Manderscheid (2001) and Pascale (2013) reported that the pastoral nomads of Tibet and Ladakh, respectively, changed their timing of migration due to changing climatic scenario. Gebresenbet and Kefale (2012) reported that herders move in search of water and pasture to different locations during different times of the year.

The comfortable zone of temperature for yak ranges from 5°C to 13°C with an average of 10°C and the relative humidity ranges from 50 to 65 percent with an average of 60 (Krishnan *et al.*, 2009). Krishnan *et al.*, (2009) also reported that Thermal Humid Index (THI) of around 52 is the comfortable upper limit for yaks and found that THI of Nykmadung area of West Kameng district (at 2750 MSL) was more than 52 during May–September. Therefore, *Brokpas* are forced to migrate to the higher altitude in the search of congenial environment. As a result, previously used transit pastures are presently using as winter halt. Pastures of near to 2500 m above MSL are presently using as transit which was previously (10-15 years back) used as the summer halt.

Table 1: Change in migration and pasture utilization as adaptation strategy by *Brokpa* pastoral nomads

Sl No.	Adaptation strategies	(percentage)							
		West Kameng district (n=76)				Tawang district (n = 72)			
		F	C	D	NF	F	C	D	NF
1	Change in timing of migration	52.4	52.6	0.0	47.3	69.4	69.4	0.0	30.6
2	Duration of migration has expanded by 2-3 months	100	84.2	15.8	0.0	100	81.9	18.1	0.0
3	Migrate to higher altitude	52.6	52.6	0.0	47.3	77.7	56.9	20.8	22.2
4	Change in pasture utilization practice	100	75.0	25.0	0.0	100	72.2	27.8	0.0

F– Followed; C – Continued; D – Discontinued; NF – Never Followed

Ranking of changes in migration and pasture utilization as adaptation strategy by *Brokpa* pastoral nomads: From the Table 2, it can be easily remarked that the adaptation strategy ‘duration of migration has expanded by 2-3 months’ was the most preferred adaptation strategy in both the studied districts. People of Arunachal Pradesh perceived that season cycle has been changed in lower and mid altitude. They also perceived that onset of summer is getting started 1-2 month(s) earlier than before and also extended by 2-3 months. Therefore, *Brokpa* pastoral nomads of Arunachal Pradesh have expanded their migration duration by 2-3 months in searching of congenial environment for their livestock specially yak and yak-cattle hybrid.

‘Change in pasture utilization practices’ was the second most preferred adaptation strategy both in West Kameng and Tawang district. Remaining two adaptation strategies, *i.e.* ‘migrate to higher altitude’ and ‘change in timing of migration’ got the equal importance. But, in case of Tawang district, ‘change in timing of migration’ were more important than ‘migrate to higher altitude’. Pasture lands of Tawang district are in higher altitude than the pasture lands of West Kameng district. Therefore, *Brokpas* of Tawang district were not forced to migrate to higher altitude in search of congenial environment for their livestock. Hence, this adaptation strategies *i.e.* ‘migrate to higher altitude’ got the least preference in Tawang district.

Table 2: Index score and ranking of adaptation strategies followed by the *Brokpa* pastoral nomads of Arunachal Pradesh

Practices	West Kameng (n=76)		Tawang (n=72)	
	Index Score	Rank	Index Score	Rank
Change in timing of migration	0.53	III	0.69	III
Duration of migration has expanded by 2-3 months	0.92	I	0.91	I
Migrate to higher altitude	0.53	III	0.67	IV
Change in pasture utilization practice	0.88	II	0.86	II

Conclusion

The *Brokpa* pastoral nomads mainly depend upon livestock like yak, yak-cattle hybrid etc for their livelihood. They perceived the change of season cycle in lower and mid altitude and onset of summer started 1-2 month(s) earlier than before and also extended by 2-3 months. Therefore, *Brokpa* pastoral nomads are forced to migrate early and to higher altitude in searching of congenial environment for their livestock specially yak. Migration duration has also been expanded by 2-3 months. Therefore, an automatic changes in pasture utilization and herd composition is visualized, which have a direct impact on the livestock production system of the region.

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