

# Improving Sustenance of Small and Marginal (*Adi*) Farmers through Traditional Vegetable Crops in East Siang District of Arunachal Himalaya Northeast India

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## ABSTRACT

The cropping pattern of indigenous *adi* tribe in East Siang district of Arunachal Pradesh, northeast India is characteristically unique, as it is based on rich traditional knowledge gained over century's experience. In order to understand the improved rural sustenance through diversification of traditional vegetable crops of small and marginal (*adi*) farmers, primary information on the diversity and utilization pattern of vegetable resources were undertaken by household and field surveys during August 2010 to April 2012. Altogether, 28 vegetable crops (both cultivated as well as wild) from 22 genera and 18 families were recorded in the present study. Solanaceae with 7 species emerged as the largest family, followed by cucurbitaceae, dioscoreaceae, fabaceae and lamiaceae with 2 species each whilst the genus to species ratio for rest of the families remained 1:1. As expected, the majority of vegetables collected were eaten fresh of which, young tender leaves ranked first, followed by fruits in the preparation of vegetable dishes. Interestingly, some of the reported plants such as *Carica papaya*, *Clerodendron colebrookianum*, *Perilla ocymoides*, *Solanum indicum*, *S. nigrum*, *S. spirale*, *Spilanthes paniculata* and *Zingiber officinale* were used as traditional medicines. The present study emphasised on the traditional vegetable crops used by the *adi* farmers of Arunachal Pradesh, northeast India.

**Keywords:** *Adi* community, Indigenous knowledge, Northeast India, Traditional vegetables

## INTRODUCTION

In Arunachal Himalaya, lush green vegetables are part and parcel of traditional food habits, mainly used as an essential complement to the daily diet, providing vitamins, minerals, fibres, specific aminoacids and other active metabolites (Maggioni 2004), eventually scaling up the dietary balance and also alleviate problems of hunger and malnutrition (Yamguchi 1983). Besides growing a few crops, people frequently collect diverse wild edible plants and other plants from natural habitats to meet their subsistence needs (Sundriyal et al. 1998). Kar (2004) reported 25 wild vegetable crops grown by the Aka tribe of Arunachal Pradesh. Cultivated

plants are more or less similar in all parts of the world with exceptional presence of lesser known cultivated plants in some regions. Nevertheless, there is lot of variation in semi-domesticated and wild plants used by different societies particularly, the tribals (Kar and Borthakur 2008). Luchen and Mingochi (1995) stated that most wild or traditional plants are specific to areas and ethnic groups. The *Adi* tribe in Arunachal Pradesh use many plants (both cultivated as well as wild) in their day-to-day life that possesses nutritional value but are not explored as yet. So the present study highlights the diversity of traditional vegetables used by the small and marginal *Adi* farmers in East Siang district of Arunachal Himalaya, northeast India.

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## MATERIALS AND METHODS

The East Siang district (Fig. 1) in Eastern Arunachal Himalaya, northeast India with a total geographical area of 4,005 km<sup>2</sup> is situated between 27° 43' to 29° 20' N latitudes and 94° 42' to 95° 35' E longitude. Three villages viz., Pasighat, Boleng and Mebo were selected for detailed study. The sites receive maximum rainfall (ca. 80%) during summer months (June-July) with relatively or none during winter months (November -February). The total annual rainfall is typically 1100-1600 mm and average day time temperatures vary from a minimum of 12° C to a maximum of 36° C in all the study sites experiencing a humid tropical climate. The main occupation of the people in the sites are farming, fishing, and hunting. Nevertheless, cattle are an additional source of income and are also employed in agriculture for ploughing and threshing food grains. A detailed field visits and surveys of 45 randomly selected farming household from each study sites were carried out during August 2010 to April 2012 and the related information regarding the diversity and use of traditional vegetables were collected through personal interviews by using a standardized questionnaire. Nearly ten field visits of approximately 6-8 days per survey were conducted in the three selected villages. Household residents were approached and the objective of the study was explained. Interview sessions usually involved 2-3 members of each farming household. Sixty two percent of the informants were females while 38 % were males, and their ages range 20 to over 65 years. Interviewed members were asked about knowledge of traditional vegetable species being used, parts used and mode of preparation as well as issues concerning their harvest. Repeated field visits were made which was pivotal as interviewees recalled additional species and confirmed information. The



**Fig. 1:** Map showing the study site

voucher specimens collected were also compared with already identified specimens at the Botanical Survey of India, State Forest Research Institute and Rajiv Gandhi University, Itanagar, Arunachal Pradesh to confirm the field plant identification. Voucher specimens were deposited at the Department of Botany, Rajiv Gandhi University, Itanagar for future reference.

## RESULTS AND DISCUSSION

The diversity in local vegetables plays an important role in the indigenous food culture of the ethnic *adi* community and also helps in achieving food security. Wild collection and cultivation of vegetable crops continues to be widespread among the rural *adi* farmers albeit western influences have considerably modified their food consumption habits. Altogether, 28 traditional vegetable crops from 22 genera and 18 families were recorded in the present study (Table 1). The most widely used vegetable species belonged to the family solanaceae with 7 species followed by cucurbitaceae, dioscoreaceae, fabaceae and lamiaceae with 2 species each; genus to species ratio for rest of the families remained 1:1. Many of these plants find way to homesteads, home gardens and agricultural lands (Srivastava et al. 2010). Earlier Kar and Borthakur (2008) reported 57 species of wild vegetables use by *Karbi* tribe of *Karbi-Anglong* district, Assam in the north-eastern region.

Interestingly, the *adi* community consume the collected local vegetables in many different ways. For instances, the vegetables may be taken either raw or cooked compensating their day-to-day calorie requirement. However, majority of vegetables are eaten fresh of which, young tender leaves ranked first, followed by fruits in the preparation of vegetable dishes. Petioles and in some cases young tender stems are also included, but old, hard stems are discarded (Vorster et al. 2002). For some plant species like *Allium* sp. (leaves and bulb), *Colocasia esculenta* (corm, leaves and stem) and all the *Solanum* spp., more than one part is used as vegetables while the whole plant was taken as vegetable in case of *Eryngium foetidum* and *Mentha arvensis*. Nonetheless, the traditional leafy vegetable dishes may be prepared from a single species or with a combination of different species. According to Vorster et al. (2005), the recipes used

to prepare the different leafy vegetables tend to be fairly homogeneous within particular cultural groups limiting culinary diversity. The popularity of specific species is function of many factors, including availability, ease of preparation, taste, consistency and appearance (Oladele 2011). Apart from nutritional value, some of the plants such as *Carica papaya*, *Clerodendron colebrookianum*, *Perilla ocymoides*, *Solanum indicum*, *S. nigrum*,

*S. spirale*, *Spilanthes paniculata* and *Zingiber officinale* were reported to be used as traditional medicine (Table 1).

Interestingly, it was observed that most of the elder people, especially the rural womenfolk were the custodians and treasures of knowledge on traditional vegetable plant species. Interestingly, in the present study, most of the agricultural work is done by the womenfolk. Generally, they (age range

**Table 1:** Local vegetable crops encountered during the study

Sl. No.	Botanical name	Local name	Family	Parts used
1.	<i>Allium</i> sp.	Bilap	Liliaceae	Bulbs and leaves are eaten raw or boiled.
2.	<i>Brassica campestris</i> Linn.	Petu (tulang)	Brassicaceae	Stem and leaves are cooked as vegetable.
3.	<i>Capsicum chinense</i> Linn.	Sibol mirsi	Solanaceae	Use in vegetables and for the preparation of traditional pickles.
4.	<i>Capsicum frutescens</i> Linn.	Pettang mirsi	Solanaceae	Use in the preparation of traditional pickles and culinary.
5.	<i>Carica papaya</i> Linn.	Omir	Caricaceae	Fruit is cooked as vegetables while flowers are used against high blood pressure and also for lactation.
6.	<i>Clerodendron colebrookianum</i> Walp.	Ongin	Verbenaceae	Leaves are boiled as vegetables dish and used against high blood pressure.
7.	<i>Colocasia esculenta</i> Linn.	Enge	Araceae	Corm, leaves and stem are taken as vegetables. Wild colocasia also serve as food for cattle.
8.	<i>Coriandrum sativum</i> Linn.	Ori	Umbelliferrae	Whole plant is used as chutney and also adds to traditional vegetables dishes to for flavour.
9.	<i>Cucumis sativus</i> Linn.	Makung	Cucurbitaceae	Taken raw as well as used for the preparation of salad.
10.	<i>Dioscorea deltoidea</i> Wall. ex Kunth.	Nginti	Dioscoreaceae	Rhizomes are taken as food.
11.	<i>Dioscorea alata</i> Linn.	Situng engine	Dioscoreaceae	Rhizomes are taken as food.
12.	<i>Dolichos laplap</i> Linn.	Ronjep/yoksik peron	Fabaceae	Taken as vegetables.
13.	<i>Eryngium foetidum</i> Linn	Ritak	Apiaceae	Whole plant is used as chutney and also for flavouring dish.
14.	<i>Houttuynia cordata</i> Thunb.	Loram	Saururaceae	Leaves are eaten raw and also cooked as vegetables.
15.	<i>Mentha arvensis</i> Linn.	Pudina	Lamiaceae	Whole plant is used as chutney.
16.	<i>Momordica charantia</i> Linn.	Kerelang	Cucurbitaceae	Fruits are cooked as vegetables and chutney.
17.	<i>Perilla ocymoides</i> Linn.	Namdung	Lamiaceae	Seeds and leaves are eaten raw and are also used as chutney. Traditionally, the leaves are also considered antiseptics
18.	<i>Piper pedicellatum</i> C. DC.	Lori	Piperaceae	Leaves are cooked with meat.
19.	<i>Pisum sativum</i> Linn.	Motor	Fabaceae	Seeds are cooked as vegetables.
20.	<i>Pouzolzia bennettiana</i> Wight	Oyik	Urticaceae	Leaves are taken as vegetable.
21.	<i>Solanum indicum</i> Linn.	Kopi	Solanaceae	Leaves and fruits are taken as vegetables and chutney. They are also used against bronchitis, asthma and toothache.
22.	<i>S. melongena</i> Linn.	Bayom	Solanaceae	Fruits are taken as vegetables and chutney.
23.	<i>S. nigrum</i> Linn.	Oko mamang	Solanaceae	Leaves and fruits are taken as vegetables and chutneys. Also used against dysentery and skin diseases.
24.	<i>S. spirale</i> Roxb	Oko bangko	Solanaceae	Leaves and fruits are use as vegetables and chutney. Leaves are also used to cure fractured bones.
25.	<i>S. torvum</i> Linn.	Bongal kopi	Solanaceae	Fruits are edible.
26.	<i>Spilanthes paniculata</i> Linn.	Marshang	Asteraceae	Leaves are taken as vegetables and chutneys.
27.	<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Onger	Rutaceae	Leaves are used as vegetables.
28.	<i>Zingiber officinale</i> Linn.	Takeng	Zingiberaceae	Rhizome are used as spices, chutney and also to treat cough.

20 to over 65 years) who do most of the weeding in the crops often distinguish between undesirable weed species and species that belong to the local collective of leafy vegetable species, which are harvested or left undisturbed for subsequent use. So the knowledge associated with collection and cultivation practice of traditional vegetable crops is purely a female domain in the study area. However, the use of traditional vegetables in the food consumption habits of *adi* community is extremely erratic and depends mostly on issues such as poverty status, degree of urbanisation and remoteness because households in remote rural areas have limited access to fresh produce from markets. Nonetheless, it was noticed that urbanisation and the influence of urban life style led the people living in town areas to usually consume more western vegetable species and lesser traditional vegetables collected from the wild, because they lack access to sites where these vegetables grow naturally. So at the community and household level, the knowledge associated with these vegetables is essentially passed on from one generation to the next whilst in certain places especially those located in nearby town and urban areas there is still risk of eroding this knowledge.

The interest in collecting and cultivating traditional vegetable crops originate from nutritional needs as well as other concerns ranging from ethical, social and economic factors (Vorster et al. 2005). Considering their potential nutritional value, the local people in the sites are strongly of the view that traditional vegetables could contribute in a major way to their food security and balanced diets. Nonetheless, Odhav et al. (2007) pointed out that indigenous vegetables and fruits represent inexpensive but high quality nutrition sources for the poor segment of the population. It was observed during the study that a number of traditional vegetable crops gathered fresh were used as a source of income and sold locally, thus improving the economic status of such communities, especially the rural poor communities. Since many of these indigenous vegetable food crops grow wild, they can be collected freely and are thus available to everyone, including the poor. Interestingly, due to market demands some rural farmers have initiated growing a few species that are still found in wild habitats (Yumnam et al. 2011). The species that are cultivated and reported in the present study may be indigenous or exotic in origin and their

cultivation may be traditional practice or recent idea. It was revealed during the course of study that traditional vegetables like brinjal, chillies, ginger, bitter gourd, papaya etc., were cultivated for commercial purpose as well as for household consumption. However, other collected vegetables are also sold in the local market at reasonable rates. Nonetheless, these vegetables are sold locally in the nearby market at a compatible price shouldering their day-to-day economic life (Table 2). They also manage to educate their children out of the income derived from the sell.

## CONCLUSION

It can thus be concluded that a harmonious blend of indigenous knowledge with modern science is decisive to uphold sustainable utilization of these traditional vegetable species. Therefore, further research on the different aspects of rural *adi* traditional vegetables, including their local cultivation and nutritional contribution is warranted. The commercialization of these traditional vegetables in the domestic markets would result in raising the standard of living, especially of the rural community.

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**Table 2:** Cultivation status and marketing of the locally available vegetables

Sl. No.	Botanical name	Cultivation status		Condition of plants			Unit in g (approx.)	Rate (Rs.)	Availability of months	
		C	M	W	F	D				P
1.	<i>Allium</i> sp.	C			F		400	10	Throughout the year	
2.	<i>Brassica campestris</i>	C			F		200-300	10	Oct-Feb	
3.	<i>Capsicum chinense</i>	C			F	D	100	5	June-Oct	
4.	<i>Capsicum frutescens</i>	C			F	D	200	5	April-July	
5.	<i>Carica papaya</i>	C			F			10/kg	Throughout the year	
6.	<i>Clerodendron colebrookianum</i>	C	M	W	F		200	10	Nov-April	
7.	<i>Colocasia esculenta</i>	C		W	F			10/kg	Oct-Feb	
8.	<i>Coriandrum sativum</i>	C			F		100	5	Dec-April	
9.	<i>Cucumis sativus</i>	C			F			10-20/kg	June-Aug	
10.	<i>Dioscorea deltoidea</i>	C			F			10-20/kg	Oct-Jan	
11.	<i>Dioscorea alata</i>	C			F			10-20.kg	Oct-Jan	
12.	<i>Dolichos laplap</i>	-			-		-			
13.	<i>Eryngium foetidum</i>	C			F		50	5	Nov-Feb	
14.	<i>Houttuynia cordata</i>	C			F	D	300	10	April-July	
15.	<i>Mentha arvensis</i>	C			F		100	5	April-Sept	
16.	<i>Momordica charantia</i>	C			F			20/kg	May-Aug	
17.	<i>Perilla ocyroides</i>	C				D	P	200	10	Throughout the year
18.	<i>Piper pedicellatum</i>	-			-		-			
19.	<i>Pisum sativum</i>	C			F			40/kg	-	
20.	<i>Pouzolzia bennettiana</i>			W	F		200	10	April-July	
21.	<i>Solanum indicum</i>	C					500	10	Throughout the year	
22.	<i>S. melongena</i>	C	M		F			20/kg	Aug-Feb	
23.	<i>S. nigrum</i>			W	F		250	10	April-May	
24.	<i>S. spirale</i>	-			-		-			
25.	<i>S. torvum</i>	-			-		-			
26.	<i>Spilanthes paniculata</i>	C		W	F		100	10	April-Aug	
27.	<i>Zanthoxylum rhetsa</i>	C		W	F	D	50	10	May-Aug	
28.	<i>Zingiber officinale</i>	C			F	D	P	20	Sept-Jan.	

where C=Cultivated, M=Managed, W=Wild, F=Fresh, D=Dried; P=Preserved or Processed, g=Grams, kg=kilograms

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