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RICE GERMPLASM DIVERSITY IN ARUNACHAL PRADESH

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Arunachal Pradesh, the land of rising sun, is a pictureseque state of India located between 26°28' to 29°30'N latitudes and 91°30' to 97°30' E longitudes. The state is a continuous stretch of Eastern Himalayan range which is surrounded by Bhutan in the West, China in the North and Northeast Myanmar in the east and plains of Assam in the South and South-east direction. The splendid floral and faunal diversity of the state is gaining international recognition as a biosphere reserve of rare order. Arunachal Pradesh is predominantly a hilly terrain. The geographical area of the state is 83743 sq. km. out of which 51540 sq.km. area (61.7%) is under forest. The total conserved area is 19325 sq. km. The total population of state is 864558, out of which 94018 belong to farming families. The population density is 10 per sq. km. There are total 13 administrative districts comprising 3649 villages where 25 major tribal groups are dispersedly inhabited. About 60-70 dialects which are distinct from one another used by independent tribes.

Key words : Rice, germplas, diversity, landraces

The topography is highly varied and the environment ranges from tropical to Alpine (640-7090m). The total cropped area of the state is 220000 hectares. Rice is the principal food of the state, which grows mostly in jhoomland. The wet rice cultivation (1,21,800 ha.) is done in river bed areas or where sufficient water is available. Due to varied topography, altitude, rainfall and the cultural heritage of different ethnic tribes, the situation leads to preserve the various rice diversities in their respective areas. Nomenclature of each landrace of rice variety is maintained by the particular ethnic group. Cultivation of high yielding varieties (HYV) of rice is recent phenomena, introduced by the ICAR Research Complex for NEH Region, Basar Centre and by the state agriculture department. Otherwise, the major local diversities of rice are maintained by the local farmers themselves. The cultivation is practiced only once in a year, under rainfed condition. Gravitational irrigation system is only practiced by the 'Apatanis' in the Apatani plateau at Ziro of Lower Subansiri district (Chowdhury *et al.*, 1993). The rice maturity duration is very lengthy which varies from 210 to 260 days due to high altitude (1600 m).

Ethnic Diversity

The ethnic diversity of the state attracts many anthropologists. The social structure, customs, culture and methods of various crop production, retention and preservation of indigenous crop germplasms are maintained by them in their own way and these are their age old practice. Conservation of crop germplasms is their traditional practice for survival. The various tribal communities are dominant in particular district. The ethnic diversity is directly related with crop germplasm diversity in respect of local nomenclature of particular variety, adaptability,

cultural practices of particular crop variety and the preference of cultivation over the local ecological condition as well as the heritage. Mere adoption of HYV do not convince them to grow, as they are much concerned over the food security. District-wise a list of major tribes of the state is given in Table 1.

Table 1. Major tribes of Arunachal Pradesh (Dominant in districtwise)

District		Tribes/Subtribes
Tawang	-	*Monpa* (Towang, Duhiang, Kolan), *Sherdukpen.*
West Kameng	-	*Akas, Mijis, Monpa, Sherdukpen, Khowas.*
East Kameng,Western & Central parts of lower Subansiri,including Papumpare district	-	*Bangni, Nissi, Nishang, Adi, Daflas, Solungs, Hill Miris.*
Eastern part of lower Subansiri	-	*Apatanis, Nissi, Solungs*
Upper Subansiri	-	*Tagins, Hill Miris.*
West Siang,Upper Siang,East Siang	-	Adi group (included communities of *Pallibe, Mitan, Bori, Tagin, Gallong, Minyong, Karbe, Pasi, Pangis, Padam*) belongs to different spoken dialects.
Dibang Valley and Lohit	-	*Mishmi* group (included communities of *Idu, Digaru* and *Miju*), *Khamptis, Deoris, Singphos.*
Changlang and Tirap	-	*Nootes, Wancho* and *Tangses, Lisus.*

Rice cultivation

In comparison with area, the population density is less and thus the crop cultivation is also limited. Rice is the major cultivated crop

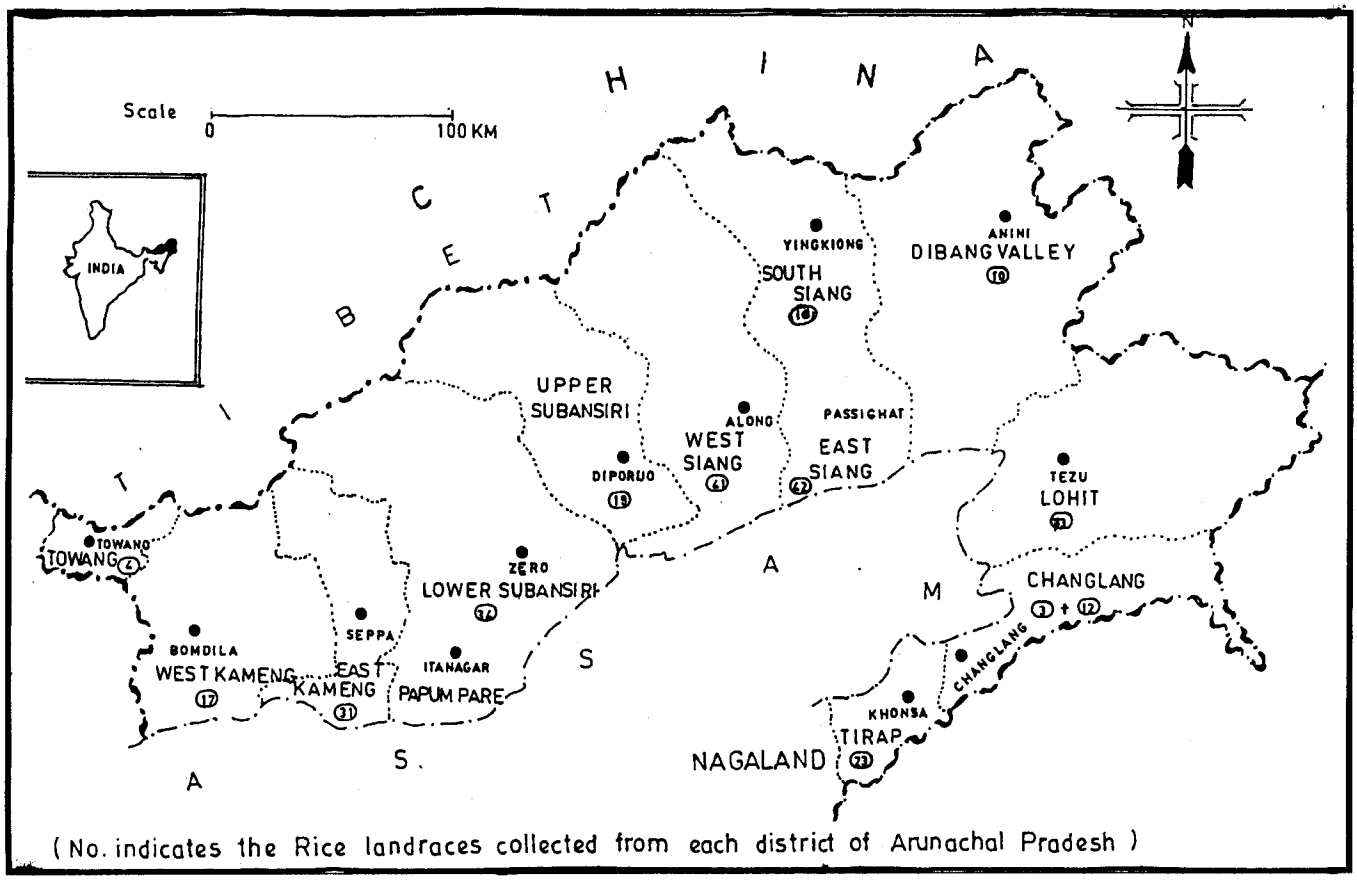

Fig. 1. Map of Arunachal Pradesh

which practiced in Jhoomland, plateaus, terraces and river bed areas. The Apatani plateau (near Ziro) is famous for well managed rice cultivation. At least 17 diverse rice landraces are cultivated in this area (1600 m.) following the indigenous method of cultivation. Due to the low temperature, the crop duration continues between 210-260 days, but the crop yield is 50-55 quintal/ha., in indigenous wet rice varieties. These varieties are short, bold grained with glutinous kernels. Harvesting of panicle is a local practice by the tribes and the spontaneous threshing is done in the field itself. Fungal diseases like blast, false smut and neck blast were observed in a few varieties.

Previous collection of Sharma *et al.* (1971) indicates that there were 1527 samples from this state and 757 accessions were maintained at Central Rice Research Institute (CRRI), Cuttack (Paroda and Sharma, 1986). Between 1987 to 1997, 14 field collection trips were conducted by the NBPGR, Shillong in various districts (Fig. 1) of the state and 976 accessions of rice germplasm were collected (Ann. Report, NBPGR, Shillong). Approximately 300 accessions belong to local landraces. The *indica* vs. *japonica* races of rice characteristics were found in some pockets of the districts (Table 2). The *japonica* strains were thus collected from the pockets of Apatani plateau of Lower Subansiri, West Siang, East Siang, Yingkiong and Trap districts. The occurrence, of course, was very rare. The characteristics of *Japonica* race of rice are grains which lack dormancy, morphologically short and roundish, do not shatter easily, poor amylose content (10-20%), and with very compact panicles. A preliminary field characterisation of seven such identified accessions of *japonica* race of rice was carried out and the result is shown in Table 3.

Rice diversities collected from the Arunachal Pradesh

In course of the survey and collection of rice germplasms from NBPGR Regional Station, Shillong, landraces collected from the different

Table 3. Characterisation data on *Japonica* rice landrace accessions

Sl. No.	Accs. No.	NIC No.	Plant height (cm)	No. of tiller	Leaf L × B (cm)	No. of panicle	Panicle length (cm)	No. of grains/panicle	5 Panicle Wt. (g)	A/AL	100 seed Wt. (g)	5-plant seed Wt. (g)	Days to maturity
1.	H-3167	NIC-22766	121.6	13.1	31 × 1.48	9.8	28.5	275.3	13	AL	1.7	100	180
2.	H-3163	NIC-22762	117.3	7.8	34 × 1.62	7.4	23.02	110.8	12.9	AL	2.4	42.5	140
3.	H-3168	NIC-22767	150.12	8.0	49 × 2.09	8.0	31.2	279.4	13.0	AL	1.7	53.5	149
4.	H-3097	NIC-22696	115.48	7.2	36 × 2.12	7.2	26.94	159.8	15.0	AL	2.4	42.3	158
5.	H-3045	NIC-22644	124.0	5.4	42.2 × 1.54	5.0	23.0	172.0	16.3	AL	2.7	70.0	156
6.	H-3177	NIC-22776	129.7	4.2	39.0 × 2.42	4.2	27.7	186.6	12.6	AL	2.1	31.0	148
7.	H-3283	Not assigned	136.5	3.0	55.18 × 2.6	3.0	29.06	226.8	15.8	A	2.7	75.0	126

districts of Arunachal Pradesh are listed below. The total number of collected rice landraces are also indicated in the Fig. 2.

District	Name of the rice landrace (s)
Tawang	Kimin red, Tso-Monpa, Soneng-kharpa, Druk-pany.
West Kameng	*Salaw, Amtheburi, Mukme, Pangra, Holadhan, Bali, Sing sung, Tapa, Bali, Nya, Nou, Yewang, rah, Nerara, Tangra, Grimcki, Nuh.*
East Kameng	*Remi, Piyti, Namni, Taba Biwe, Lorry, Ralong, Adi, Tening, Naga-Am, Ningpung, Am- Tapu, Khilling, Longro, Mikka, Bengkor, Yarte, Lomok-longro, Bray- Am, Naga, Ralo, Machbung, Pucho, Rame, Choke, Mikar, Maland, Loro, Paki, Nimkuri, Yemone.*
Papum Pare	Nil
Lower Subansiri	*Pyapu, Pyapon, Puyi, Pyapi- pyakke, Pyapi, Pyatkogya, Pyatpyani, Pyaping-pyani, Kimin,B habeli- Joha, Bomo-Am, Tawa, Ellang-Emmo, Khilling-Am, Deiji-Am, Pyaping Pyapu, Empu-Arey, Omto, Kogya-Mepia, Tawa-Am, Ala-Amo, Ampo-Amo, Mipia- piyati, Piyapi-Mipia, Radhe-Amo, Puyaping, Emmo, Nishi-Mipia, Misa,Oye- impo, Ji-pyat, Pyat-pyare, Maina.*
Upper Subansiri	*Pana, Tesa, Keli, Kesa, Bali Badam, Gapu, Pemin, Bey, Sarali, Mesa pale, Batkili, Pani-Am, Am- litchi, Am-Nginre, Am-kesa, Tarti, Puyi, Libo, Repu.*
West Siang	*Ankor, Yabor, Bali, Yambor, Kimin, Yamruk, Tapey, Royla Amo, Hibar- hirpu, Yapu-pumik, Pirini, Simoi, Icehonse, Bali-lite, Tuinu, Wangkhan, Kesa, Yasing, Deppu, Mededeli, Nilony, Yaling, Pehi, Papuk, Mugme, Nipun, Tapa, Badap, Mukme, Yamuk, Lemuk, Milong, Laudulei, Buing, Yasing, Bee, Pehi, minre, Leli, Lite, Riyu.*
Upper Siang	*Jagum, Tufum, Dangki, Ammong, Param, Gobuk Amo, Pinying, Pimlak, Retling, Amka, Jajum, Boi.*
East Siang	*Amo, Amyong, Amte, Amiong, Oikey, Amolang, Amdang, Tafun, Riyum, Damruk, Kayor, Mingingin, Badap-Amker, Amker, Yaber, Bali, Lamukh, Pelu, Rige-Kenmanyam, Neeli, Kuriang, Kerjok,Jajum, Joy-Bangla, Kokobaon, Amdang, Puyang, Amka, Neuli-Am, Katchia-Am, Riyu, Damruk, Dangum, Badsa-Am, Amkel, Kasiya, Kiyet, Khamti, Param, Takil, Ampang, Jorang.*
Dibang Valley	*Myu, Myun, Piyong, Mangtulu, Ahumang, Mangkatik, Jijuka, Bira, Kepu, Amiong.*
Lohit	*Keh, Khorcha, Khownamtok, Khawmakhew, Kamplanginang, Khownowjoma, Khamang, Khucho, Khomo, Kanchalmang, Khongkhat, Kya, Ketulu, Ke-Tapok, Ke-kalti, Holpeena, Deodhan, Toiyal, Ke-jaujong, Khownamtu, Khawpakhi, Khownujoha, Khojohalia, Mag-kampblu, Mang-kasai, Khongkhat, Khonu, Kepu, Khamang, Khono, Khatu, Khopsan, Kenah, Misi-maibong, Ke-bathah, Manzang, Loiliangha, Ke-mebo, Tongna, Champath, Khaomak-chow, Namah, Katiha, Peengha, Kehuseh, Kemebo, Ke-Jabiah, Ke-horpa, Khonow chew, Khao-kauli, ke-mee, Khoikan, Ke-mal, Ke-saw, Khaonon-Tek, Khanao- long, Khaojing, Khaojiling, Khapaki, Mukok-khae, Khomunon, Khano-heking, Khao- namtak, Myu, Myum, Piyong, Mangtulu, Khejohalai, Khowchi, Khow-nue- nak, Khow-un, khow-jee,Khow-neuri, Namtik-lung, Namtik-ann, Khow- nue, Khow-nue-chow, Khou-khot, Khow-namte, Khow-un-ann.*
Changlang	*Jajum, jumsing, Hamnyak.*
Tirap	*Champo, Chachiya, Tuisa, Jhasi, Khumyu, Jhakale, Kaleshi, Ajeja, Jhalu, Jhalugele, Ams, Janyu, Chichijanyu, Amuje, Jachene, Longkhap, Shimoi, Kanyak, Komi, Champe, Chamtim, Betguti*

CONCLUSION

The hilly agro-ecosystem of the state of Arunachal Pradesh is based on the cultivation of a diversity of crops and varieties in time and space which have allowed traditional farmers to maximize harvest security by adopting their innovative methodology and limited resource input. While considering the rice genetic resources

and the farmers agricultural development, various genetic, ecological and socio-economic issues are interplay simultaneously within it. The Farmer's strategy is to minimize the risk by planting several species and varieties of crops that stabilizes yields over the long term, promotes diet diversity and maximize the returns under low levels of technology and limited resources (Harwood, 1979).

The traditional agro-ecosystems of Arunachal Pradesh containing rice crop population of variable and adapted landraces. The farmers goes for planting of multiple varieties which also allows both intraspecific and interspecific diversity and thus enhancing harvest security. The wide variability of primitive crop cultivars correspond well with the heterogeneity of the social and ecological environment (Brush, 1982). The statement is no way exception in case of *Khamptis* of Lohit Valley, where they are now maintaining at least, 75 rice land races. The conservation of *japonica* race of rice which are available in some pockets of the state are invaluable material for the country.

The best mode of approach to protect and conserve all these valuable rice landraces of Arunachal Pradesh would be

i) To gather the knowledge the gene pool of this ricelandraces and categorically collect and conserve them at first instance.

ii) Stress the value of traditional cultivation practice towards the preservation of this native rice diversities on farmers field and to protect the local and adjacent ecological conditions. Farmers may be guided and encouraged in this direction.

iii) Monitoring the trend of genetic erosion at suitable time interval and at alarming situation, strategy for 'On-farm Conservation' can be adopted.

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