Chapter 37

Use Value of Rice and Wheat Land Races in the Public Sector Breeding Programmes in Nepal

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Genetic resources are valuable assets for any country. Land races, in particular, are the patrimony for breeders involved in crop improvement. The evolution and existence of land races within a country depend largely on its variation in altitude, topography, climate, and ecosystems. The wider the variation in these factors, the greater the Genetic Diversity.

Wheat Land Races and Breeding Use

The mid- and high-hill (MHH) zone of Nepal, is generally considered to be the traditional wheat belt in which a number of land races is still under cultivation. On average there is more diversity in the western part of Nepal than in the eastern part. Different areas have been explored in the past by several national and international agencies and concerned individuals. During 1979, a total of 85 *Triticum aestivum* accessions were collected from the western and mid-western hills by an IBPGR/FAO mission (Erksine and Bourgois 1979). At present, the Plant Genetic Resource Unit (PGRU) of the National Agricultural Resource Councils (NARC) has a total of 381 wheat accessions (Adhikari et al. 1994).

Nepalese wheat land races have been evaluated for both general and specific traits by several workers. In general, these land races have been reported to be relatively resistant to hail damage, drought stress, and storage weevils (Erksine and Bourgois 1979). Other important attributes of these land races have been identified, for example, prolonged dormancy (Rajbhandary 1976), high protein content (Haldore et al. 1982), wider range of variability (Gilani 1985; Damania and Jackson 1986), cytogenetic implications for improvement in bread-making

qualities (Damania 1985), tolerance to stripe rust (Mudwari 1988), and spikelet sterility (Joshi and Sthapit 1995). Some of the outstanding land races have the ability to outyield the old standard reference varieties such as RR 21 under stress conditions (Chand 1985).

Some of the land races were used in crossing programmes during the late seventies and early eighties. A total of 219 simple crosses (Local x Improved) were attempted at the National Wheat Research Programme (NWRP), Bhairahawa, in 1979/80 to 1982/83. However, as a result of their extreme susceptibility to leaf rust (*Puccinia recondita*) and lack of acceptable phenotypes, almost all the progenies resulting from these crosses had to be discarded by the time they reached multilocation screening nurseries and yield trials (Devkota 1985). As a result, the approach of using land races in crossing programmes has changed over time from simple crosses to triple or multiple crosses (Local x Improved x Improved) in order to incorporate disease resistance and acceptable phenotypes. Some popular land races have been used in this crossing programme: *Dabdi local* from the far western hills; *Lumle (Paundur)* local from the western hills; and *Balangkha local, Change local, Masino Gahun, Sano Gahun,* and *Pangdure Gahun* from the eastern hills (Table 37.1). Unlike the earlier progenies from single crosses, progenies from these triple and multiple crosses have progressed towards production of succeeding generations. Land races such as *Hansi, Hande, Dolakha, Darmaili, Dabdi local,* and *Lumle local* have been used widely in a similar programme at Khumaltar using top/multiple crosses for breeding hill varieties (Mudwari 1988).

Table 37.1: **Wheat Land Races in the Breeding Programme at the NWRP, Bhairahawa, 1995/96**

SN	Cross	Pedigree	No.
1	Dabdi Local/NL 297/3/NL 539/Siddhartha//NL 297/4/BL 1022.	NC 2119-	27
2	Lumle Local/NL 297/3/NL 251/Fan#1//NL 297/4/NL 539	NC 2120-	7
3	Balangkha Local/NL 297/3/NL 297/Ning 8319//BL 1022/4/NL 539	NC 2121-	13
4	Change Local/NL 297/3/NL 297/Ning 8201//BL 1022/4/NL 539	NC 2122-	9
5	Masino wheat/NL297/3/Siddhartha/Ning 8319//NL 297/4/NL 539	NC 2123-	13
6	Sano wheat/NL297/3/YMI#6/NL 539//NL297/4/BL 1135	NC 2124-	7
7	Pangdure wheat/NL297/3/NL251/G 162//NL 297/4/NL 539	NC 2125-	6

Rice Land Races and Their Use

The tremendous Genetic Diversity in the rice crop in Nepal is evident from the existence of more than 2,000 land races of cultivated rice, four wild *Oryza* species (*O. nivara, O. ruffipogon, O. officinalis,* and *O. granulata)* and two wild relatives (*Leersia hexandra* and *Hygrorrhiza aristata)* in different places (Gupta et al. 1996). Different agencies have been involved in the exploration of rice land races in Nepal. Several missions have collected many land races from different parts of the country, and, as a result, the NARC has a collection at present of 2,387 rice

accessions (Adhikari et al. 1994). Recent evaluation of 115 accessions has shown a wide range of variability for different characteristics such as early heading, dwarf height, tall height, higher culm number, sturdy plant, large panicles, and scented type (Gupta et al. 1996).

So far, of 680 accessions evaluated at the National Rice Research Programme (NRRP), Parwanipur and Khumaltar, Kathmandu, 24 were identified as important sources for blast resistance and four for cold tolerance.

Some of the outstanding land races of rice, such as *Jumli Marshi, Chhote Marshi, Raksali, Pokhareli Masino, Jarneli, Chhomrong, Darmali,* and *Dhunge Dhan,* have been used in the breeding programme. Some cultivars such as Khumal-2, Khumal-4, Khumal-5, Palung-2 resulting from local x improved crosses have already been released for general cultivation, and many others are in the pipeline (Table 37.2).

Table 37.2: **Use of Rice Land Races in the Breeding Programme of the NRRP**

SN	Genotypes	Cross and pedigree	Remarks
1	Khumal-2	Jarneli/Kn-16-361-BLK-2-8	Fine grain, released in 1987
2	Khumal-4	IR28/Pokhareli Masino	Fine grain, released in 1987
3	Palung-2	BG 94-2/Pokhareli Masino	Fine grain, released in 1987
4	Khumal-5	Pokhareli Masino/Kn-1B-361-BLR-2-6	Fine grain, released in 1990
5	Chhomrong Dhan	Local selection	Cold tolerant, released in 1991
6	NR 10157-2B-7-1-1	Jumli/IR 9129/Kn-1b-361	Promising line
7	Machhapuchre-3	Fuji 102/Chhomrong Dhan	Cold tolerant, released in 1996
8	NR 10293	Fuji 102/Jumli Marshi	Advanced line
9	NR 10250	Fuji 102/Chhommro	Advanced line
10	NR 10258	Akiyudaka/Jumli Marshi	Advanced line
11	NR 10260	Akiyudaka/Chhote Marshi	Advanced line
12	NR 10296	Stejaree 45/Jumli Marshi	Advanced line

Sthapit (1991) identified a highly cold-tolerant rice land race, and it was released by the NARC for high altitude villages. Land races can also be improved in those areas where farmers do not have access to other varieties. The variety, *Chhomrong Dhan,* has resistance to bacterial sheath brown rot diseases (*Pseudomonas fuscovaginae*) and blast, besides being cold tolerant (Sthapit et al. 1995, 1996). These valuable genes from a local land race were successfully exploited to develop the new Machhappuchre-3 and 9 varieties (Fuji 102/ Chhomrong Dhan) with better quality.

Issue

With increasing efforts placed on popularising the improved genotypes, and considering the way modern high yielding varieties (HYVs) are replacing traditional

cultivars, it seems that the valuable land races of both wheat and rice are likely to become extinct. This may seriously limit the scope for crop breeding to develop ecological niche-based varieties. The situation is worse for wheat than for rice, as at present the rate of replacement of traditional varieties by improved ones is much faster.

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