

Farmer-led Participatory Plant Breeding (PPB) in The Mid Hill of Nepal: A Case Study

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Introduction



Figure 1. Researcher in the Gulmi 2 seed production plot

Maize (*Zea mays L.*) is the most important livelihood crop in the mid hills of Nepal, where more than 70% of the total maize area of the country is situated in the hills (MoAC, 2010). In the western mid hill districts maize is mainly cultivated on sloping terraces under rain-fed conditions (Figure 2). Farmers in these areas have poor access to improved genetic materials and information (Sunuwar *et al.*, 2006). These areas are dominated by local landraces and most of these landraces are highly prone to lodging and diseases (Figure 3). Realizing the fact that these landraces needed improvement, LIBIRD/HMRP-CIMMYT/NMRP initiated a farmer led maize improvement programme from 1998 in two VDCs, Darbar Devisathan and Simichaur of Gulmi district.

Methodology

LI-BIRD facilitated to form a Farmers' Research Committee (FRC) of innovative farmers which took initiative to set up the breeding goal and breeding plan to improve *Thulo Pinyalo* (literally meaning "Big Yellow"), a local maize variety. The major objective was to reduce the lodging problem followed by leaf diseases in *Thulo Pinyalo* through crossing. Ten farmers collaborated in the crossing programme and made six crosses: *Thulo Pinyalo* x Rampur Composite, *Thulo Pinyalo* x Ganesh-1, *Thulo Pinyalo* x Khumal Yellow, POP 22 x *Thulo Pinyalo*, Ganesh-1 x Rampur Composite, Ganesh-1 x *Thulo Pinyalo*. Farmers preferred the population developed from the cross *Thulo Pinyalo* x Rampur Composite and named it as Gulmi 2 (Table 1). Gulmi 2 has been tested widely in mother baby trials, IYTs, CVTs and IRD by LI-BIRD, DADOs and NMRP/NARC.



Figure 2. Landscape of study-site.



Figure 3. *Thulo Pinyalo* (Local landrace) lodging in field condition.

Table 1. Summary of improvement of *Thulo Pinyalo* through farmer-led PPB following the scheme phenotypic recurrent selection

Year	Area	Selection Cycle	Methodology
2000	500 m ²	First Selection Cycle	Six crosses made, including <i>Thulo Pinyalo</i> /Rampur Composite; 1:3 Female: Male ratio for pollination
2001	750 m ²	Second Selection Cycle	Planting in isolation, -ve mass selection and bulking
2002	2500 m ²	Third Selection Cycle	Planting in isolation, -ve mass selection and bulking
2003	3000 m ²	Fourth Selection Cycle	Planting in isolation, +ve selection (plant, cobs and seed) and bulking
2004	6000 m ²	Fifth Selection Cycle	Planting in isolation, +ve selection (plant, 150-200 cobs) and bulking. Mother trials
2005	6000 m ²	Sixth Selection Cycle	Planting in isolation, +ve selection (plant, 150-200 cobs) and bulking. Mother trials
2006-2008		Seventh to Ninth Selection Cycle	<i>Thulo Pinyalo</i> /Rampur Composite selected from participatory evaluation, organoleptic tests. Mother trials, Baby trials, IYT, CVT. Seed production
2009-2011		Tenth to Twelfth Selection Cycle	Mother trials, Baby trials, IYT, CVT. Seed production, Proposition for release in the name Gulmi 2

Results and Discussions

Gulmi 2 has a comparable yield performance with popular released maize variety, Deuti in low input conditions and better to local *Thulo Pinyalo* variety. The yield potential of the variety is 5.1 ton/ha (Figure 4).

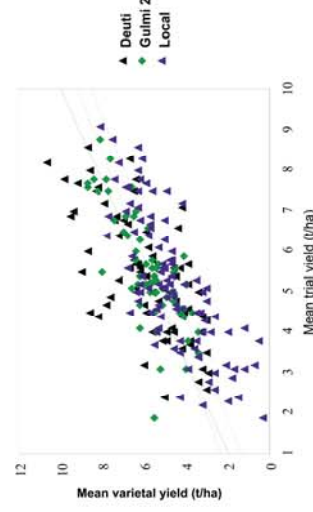


Figure 4. Stability of Gulmi 2 over standard check variety Deuti and local check observed in IYTs, CVTs and mother yield trials (n=64) 2004 to 2009.

- Gulmi 2 retains several adaptive traits of *Thulo Pinyalo* like flint kernel with attractive yellow colour (Figure 1), sweet taste and high grit recovery.
- The height of Gulmi 2 is about 50 cm lower than the local *Thulo Pinyalo*. This has highly reduced lodging problem. But it is still tall enough to fulfill the stover demand of the farmers (Figure 1).
- Gulmi 2 possesses stay green trait. It is moderately resistant to common maize diseases.
- Analysis showed that Gulmi 2 tested in baby trials was much preferred to the local varieties in terms of traits like lodging resistance, insect-pest reactions, ear size, maturity, storage etc.

Conclusion

- Integration of farmers in plant breeding process utilizes farmers' knowledge on crop genetic resource management and accelerates local crop improvement.
- The PPB process enhanced natural, social and human capitals to generate financial capitals for their sustainable livelihoods.
- Gulmi 2 variety is an outcome of Farmer-led PPB.
- The registration of this variety will certainly raise interest among plant breeders and policy makers.

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