Grassroots breeding: a simple participatory crop improvement approach

Grassroots breeding is a simple plant breeding approach targeted to improve locally adapted landraces by directly engaging farmers and community organizations in the plant breeding process. The term ‘grassroots breeding’ is coined to capture a simple plant breeding approach that strengthens the organizational and selection skills of farmers and communities in plant breeding, used production and marketing strategy (Shipton and Rao, 2007). The final outcome of this approach is farmers preferred landrace accessions or improved landraces for cultivation, consumption and supply to the market. Grassroots institutes like Cooperatives, Community Seed Banks (CSBs), Community Based Seed Production farmer Cooperatives (CBSPs) are engaged during improvement activities and farmers’ preferences are identified with preference ranking methods. Grassroots breeding can also explore the potential underutilized crops for their increased cultivation, seed availability and accessibility in local area. Quality seeds of promising landraces can be increased, maintained, exchanged between farmers and supplied with truthful labels to the consumers and market on demand through grassroot institutes provided that the technical support comes from plant breeders, agricultural scientists and agricultural research and development organizations. Several case studies were reported by Shipton et al (2011). Major steps in grassroots breeding along with two case studies on pruno millet (Humla) and finger millet (Humla) landraces are summarized in this paper.

References

Grassroots breeding steps and workflow

1. Locating the crop diversity
2. Gathering the farmer preferred traits, market linkage and diversity blocks
3. Participatory evaluation of the collections during crop growth, seed multiplication and maintenance
4. Ensure seed availability, access and supply through community based organizations
5. Participatory evaluation in multiple locations, seed quantity increased and maintained.
6. Quality seed production, maintenance and supply to the community farmers and market through CSBs, cooperatives, farmer groups etc.
7. Participatory evaluation in multiple locations, seed quality improved and maintained
8. Supply truthfully labeled seed to the farmers and market
9. Genetic diversity assessed, evaluated and selected accessions or landraces identified for multi-location testing
10. Supply truthfully labeled seed to the farmers and market

Case Study I: Grassroots breeding on Finger Millet (Rato Kodo) in Humla, Jumla

Farmer preferred traits:
1. Higher yield
2. Early maturity
3. Easy thresh ability
4. Good taste
5. Finger blast resistance

Case Study II: Grassroots breeding on Proso Millet (Dudhe Chino) in Chhipara, Humla

Farmer preferred traits:
1. Higher yield
2. Early maturity
3. Easy thresh ability
4. Good taste
5. Neck blast resistance

Figure 1. Grassroots breeding steps and workflow: (A)adapted and modified from Shipton and Rao (2007)

Figure 2. Local Finger Millet landraces were used for the early monitoring as well as highest yielding among other collections were preferred by farmers in Jumla.

Figure 4. Among those sixteen collections, HCC-2016 has the highest yield and also was highly preferred by farmers whereas HCC-15 has the second highest yield and was preferred by farmers during participatory evaluation on farm in Humla during 2017. The best performing collections along with subpopulations,铲皮to existing collections need preserved and maintained with truthful label.

Case Study II.

Table 1. Two of the best Dudhe Chino collections (HCC-2016 and HCC-2015), three varieties from the local Dudhe Chino collections were tested in multiple locations in Humla during 2016. Seed from these collections are preserved and maintained by CSB in Chhipara, Humla.

Figure 5. Two of the best Dudhe Chino collections (HCC-2016 and HCC-2015)three varieties from the local Dudhe Chino collections were tested in multiple locations in Humla during 2016. Seed from these collections are preserved and maintained by CSB in Chhipara, Humla.

Figure 6. Among those sixteen collections, HCC-2016 has the highest yield and also was highly preferred by farmers whereas HCC-15 has the second highest yield and was preferred by farmers during participatory evaluation on farm in Humla during 2017. The best performing collections along with subpopulations,铲皮to existing collections need preserved and maintained with truthful label.

Figure 7. Among those sixteen collections, HCC-2016 has the highest yield and also was highly preferred by farmers whereas HCC-15 has the second highest yield and was preferred by farmers during participatory evaluation on farm in Humla during 2017. The best performing collections along with subpopulations,铲皮to existing collections need preserved and maintained with truthful label.