

## Grassroots breeding: a simple participatory crop improvement approach

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**Grassroots crop breeding** is a simple plant breeding approach targeted to improve locally adapted crop 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, seed production and marketing strategy (Sthapit and Rao, 2007). The final outcomes of this approach are farmer 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 groups (CBSPs) are engaged during crop 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 Sthapit et al (2013). Major steps in grassroots breeding along with two case studies on proso millet (Humla) and finger millet (Jumla) landraces are summarized in this paper.

### References:

Sthapit, B. R., & Rao, V. R. (2007). Grassroots breeding: a way to optimise the use of local crop diversity for well-being of people Paper presented at the Tropentag International Conference, 9–11 October, 2007. *Witzenhausen, Germany*.  
 Sthapit B. R., Khadka, K., Shrestha, P., Subedi, S., Poudel, I. (2013). 5.2 Grassroots breeding of local crops and varieties in support of community biodiversity management and resilience in Nepal. In: de Boef, W. S., Subedi, A., Peroni, N., Thijssen, M., & O'Keeffe, E. (eds), *Community Biodiversity Management* (pp. 267-273). Routledge.

### Grassroots crop breeding methodology:

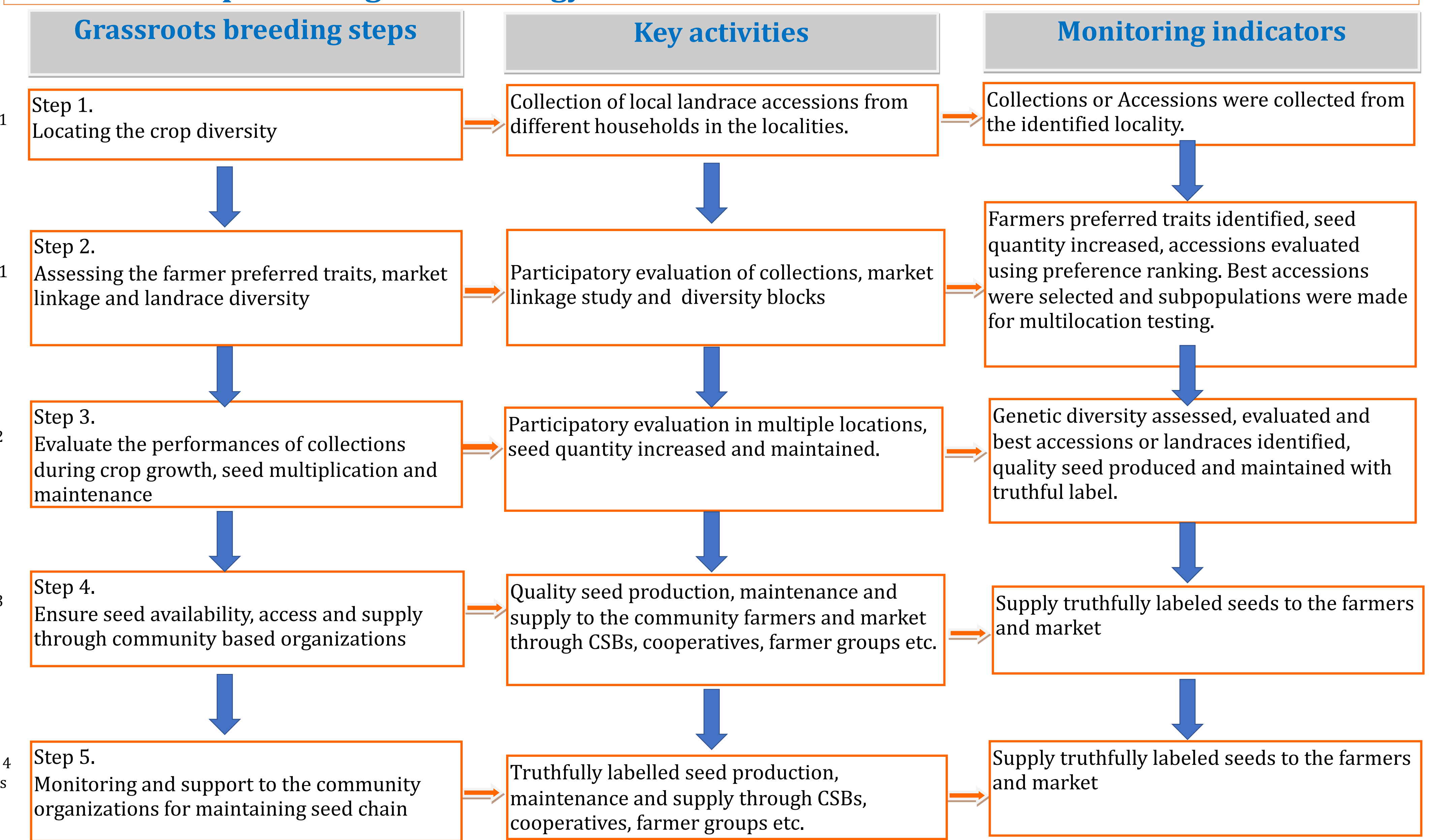


Figure 1. Grassroots breeding steps and workflow [Adapted and modified from Sthapit and Rao (2007)]

#### Case Study I. Grassroots breeding on Finger Millet (Rato Kodo) in Hanku, Jumla

Collection ID	Farmer preferred traits:
1. JRK -01-2016	1. Higher yield
2. JRK -02-2016	2. Early maturity
3. JRK -03-2016	3. Easy thresh ability
4. JRK -04-2016	4. Good taste
5. JRK -05-2016	5. Finger blast resistance
6. JRK -06-2016	
7. JRK -07-2016	
8. JRK -08-2016	
9. JRK -09-2016	
10. JRK -10-2016	
11. JRK -11-2016	
12. JRK -12-2016	
13. JRK -13-2016	
14. JRK -14-2016	
15. JRK -15-2016	
16. Local Rato	
17. Local Kalo	
*JRK=Jumla Rato Kodo	

Seventeen finger millet (Rato Kodo) collections were made from different farmers and planted in diversity blocks in Jumla during 2017. The best performing collections were tested for on farm performance in Jumla.

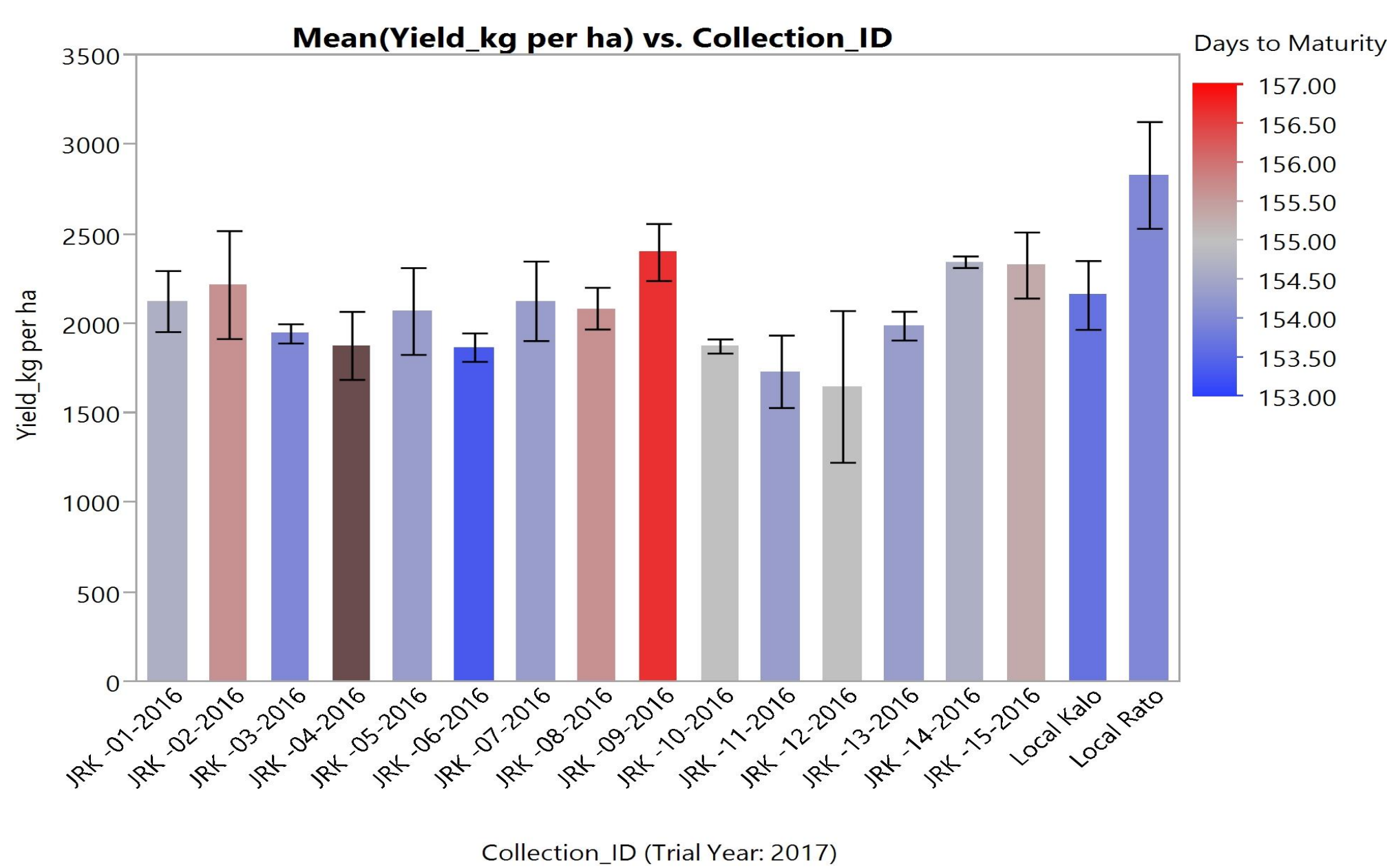


Figure 2. Local Rato Kodo was found to be the early maturing as well as higher yielding among other collections and was preferred the most by farmers in Jumla.

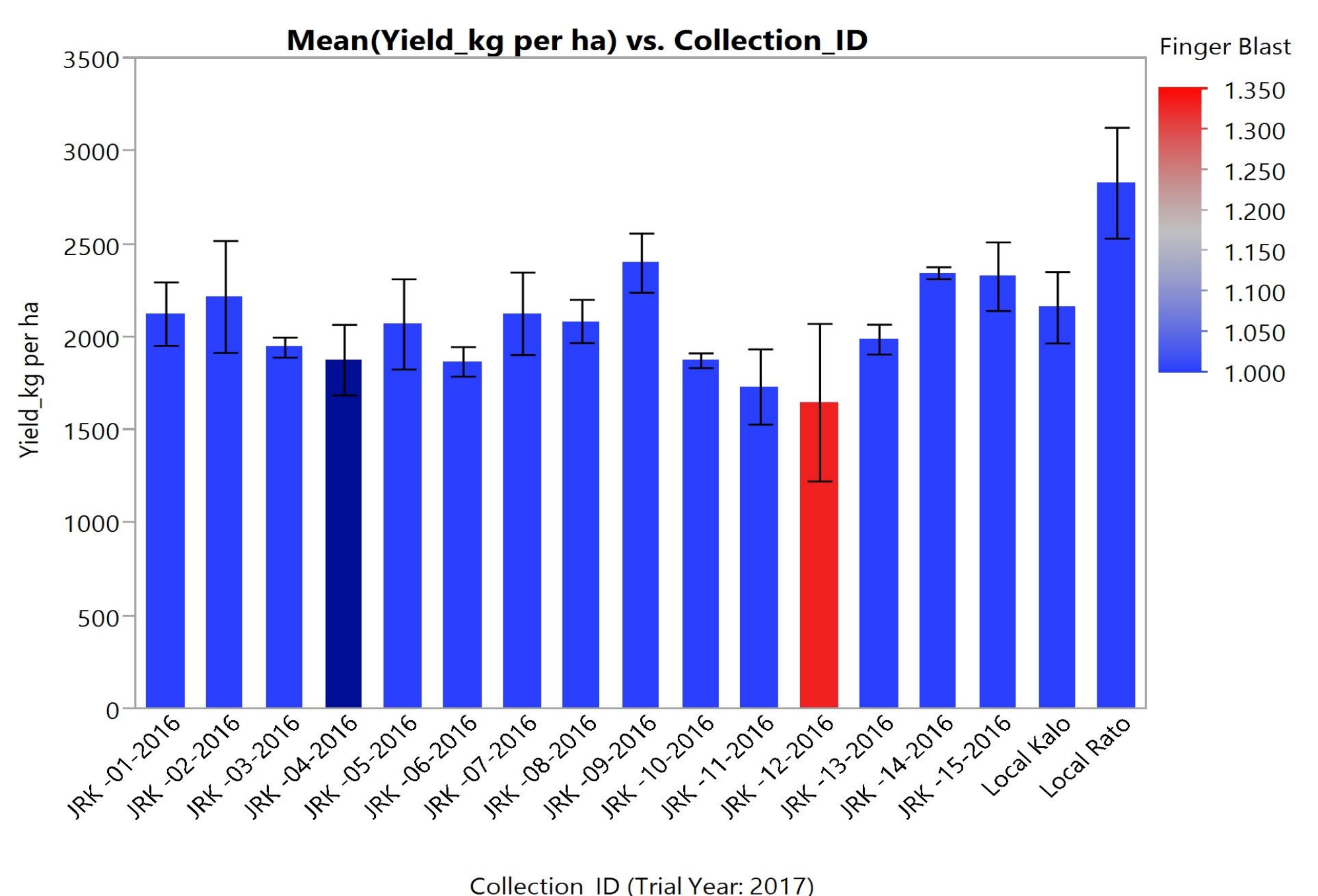


Figure 3. Local Rato Kodo has very low finger blast score and highest yield than others and quality seed was maintained, conserved and exchanged with farmers in Jumla.

#### Case Study II. Grassroots breeding on Proso Millet (Dudhe Chino) in Chhipra, Humla

Collection ID	Farmer preferred traits:
1. HDC-01-2016	1. Higher yield
2. HDC-02-2016	2. Early maturity
3. HDC-03-2016	3. Easy thresh ability
4. HDC-04-2016	4. Good taste
5. HDC-05-2016	5. Neck blast resistance
6. HDC-06-2016	
7. HDC-07-2016	
8. HDC-08-2016	
9. HDC-09-2016	
10. HDC-10-2016	
11. HDC-11-2016	
12. HDC-12-2016	
13. HDC-13-2016	
14. HDC-14-2016	
15. HDC-15-2016	
16. HDC-16-2016	
17. HDC-1.2.3.4-2016	
18. HDC-1to16-2017	
19. HDC-5.10.12.13.14-2017	
20. Local Dudhe Chino	
21. Rato Chino	
*HDC=Humla Dudhe Chino	

Sixteen proso millet (Dudhe Chino) collections were made from different farmers and planted in diversity blocks in Humla during 2017. The best performing collections along with subpopulations, made by mixing two or more collections together, were tested for performance on farm at multiple locations in Humla.

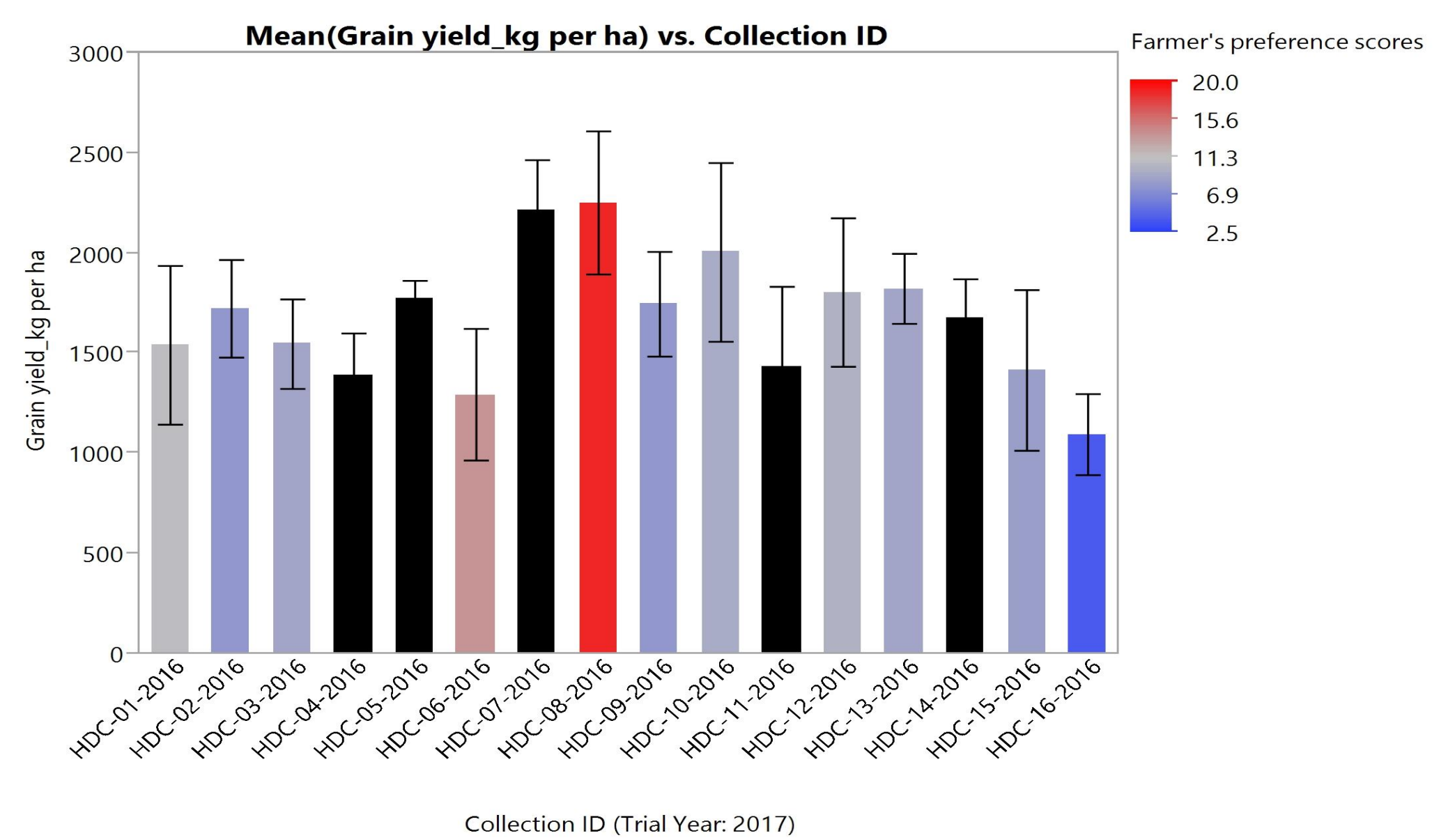


Figure 4. Among those sixteen collections, HDC-08-2016 has the highest yield and also was highly preferred by farmers whereas HDC-16-2016 was lowest yielding and least preferred by farmers during participatory evaluation on farm in Humla during 2017. Black color indicate either zero or non significant preference scores.

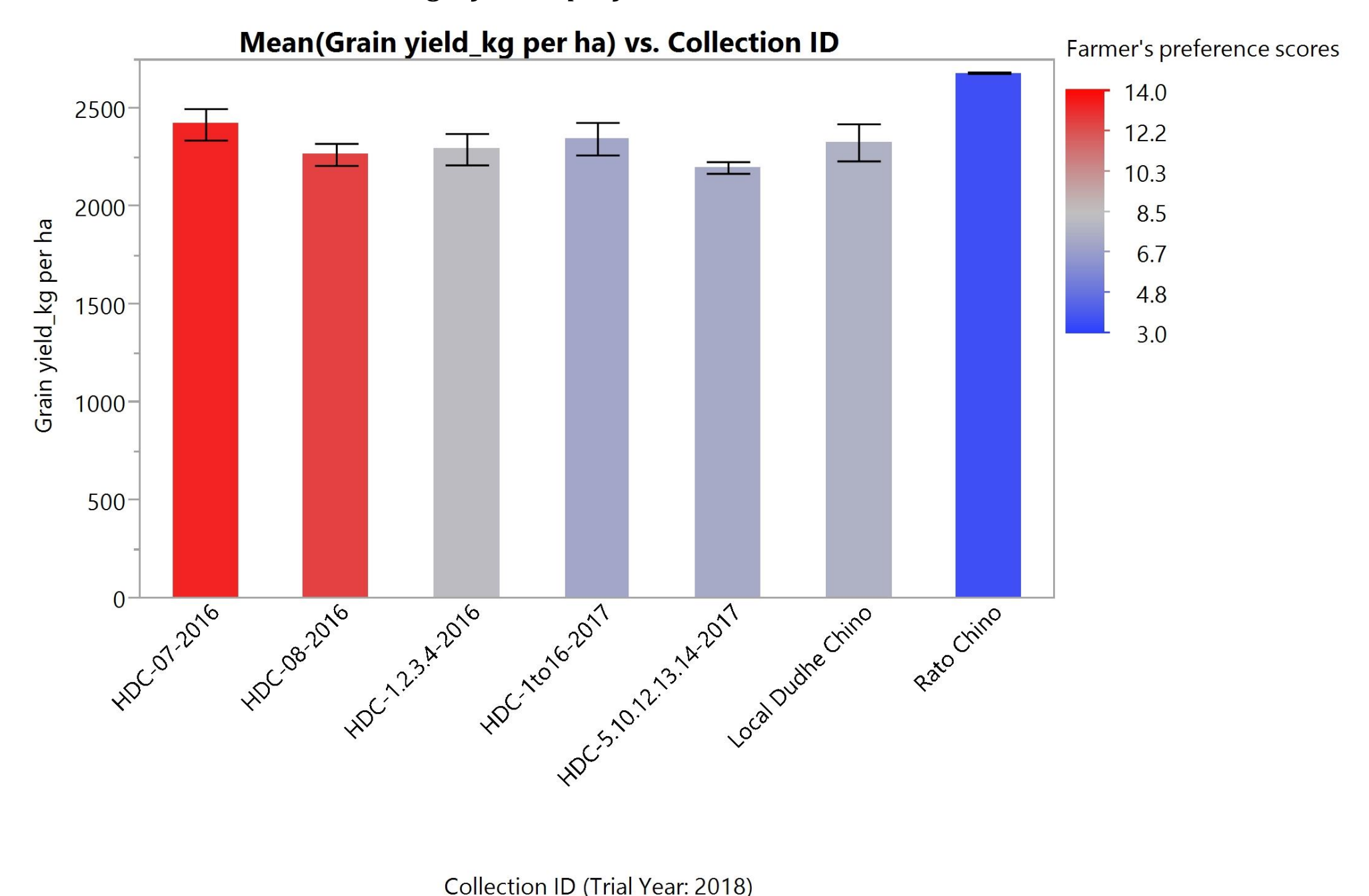


Figure 5. Two of the best Dudhe Chino collections (HDC-07-2016 and HDC-08-2016), three mixture lines, one local Dudhe Chino and one Rato Chino collections were tested in multiple locations in Humla during 2018. Seed of those collections are produced and maintained by CSB in Chhipra, Humla.