

Stories of change

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Small millet farmers increase yields through participatory varietal selection in South Asia

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Key messages

- Small millets are more nutritious and have a lower glycemic index than rice and wheat, but lack of improved varieties and an organized seed system are constraining production.
- Using participatory varietal selection (PVS), farmers have identified small millet varieties that yield over 15% more than existing ones; PVS is much quicker than conventional crop breeding.
- The selected varieties are now being taken up by the formal seed supply and varietal development institutions in India, Nepal and Sri Lanka. Up to 4,000 farmers will have access to quality small millet seeds by the end of 2014.
- Greater varietal diversity in small millet cultivation will help to reduce farmers' vulnerability to adverse weather conditions and to pests and diseases.

a cheaper source of dietary calories, small millets offer better nutrition, containing higher levels of various micronutrients, including vitamin B, calcium, iron and sulfur. Small millets are also rich in dietary fiber, have low glycemic index and are valued for their preventive and curative health properties (Varma & Patel, 2013; Yenagi & Mannurmath, 2013). They are also known for their water stress tolerance, which makes them suitable for rainfed agricultural systems threatened by climate change.

However, despite their value to food and nutrition security in South Asia, production, and hence consumption of small millets is in decline. According to India's Directorate of Millets Development, the area under small millets in the country fell from 7.6 million hectares in 1955-56 to 2.3 million hectares in 2008-09, with production falling from around 4 million tons to 2.85 million tons over the same period (Government of India, 2012).

Major production constraints include the low yield of existing varieties, poor seed quality and lack of access to improved varieties by farmers. In response, the *Revalorizing Small Millets in Rainfed Regions of South Asia* (RESMISA) research project aims to address constraints related to the production, distribution, and

Context

Small millets, an important group of coarse-grained cereals, have suffered a loss in popularity in recent times. While cereals provide



consumption of small millets, focusing on finger millet, little millet, barnyard millet and kodo millet in eight project sites: six in India, one in Nepal and one in Sri Lanka. Enhancing varietal diversity, through identification and promotion of farmer-preferred varieties, is a key strategy.

A new approach

Conventional varietal improvement approaches in small millets have certain limitations, tending to focus on the wider geographical scale rather than the niche environments in which the crops are mainly cultivated. Participation of farmers within these programs is limited and selected varieties take a long time to reach farmers. Recognizing this, RESMISA adopted a participatory varietal selection (PVS) approach, bringing together farmers and scientists to tackle location specific varietal improvement issues. PVS trials have been carried out by farmers in their own fields at eight project sites. In three cycles of selection, 76 local varieties, 44 released varieties and 37 pre-release varieties of small millets were tested with around 1,900 male and 1,400 female farmers. In all the sites, one to six farmer-preferred varieties were identified per crop in just three years.

Emerging outcomes

Improving awareness among small millet farmers and scientists

A change in knowledge and attitude is taking place for both farmers and scientists. Farmers were able to compare between four and 22 varieties of small millets in each project site. Through their involvement in the trials, farmers are now more aware of the advantages to be gained from testing different varieties available from across the region and other parts of the country. Some farmers involved in the varietal selection have adopted one or more of these varieties on a large proportion of their land.

The success of varietal testing means that the identified varieties can be spread to areas with similar agro-ecological conditions. When farmers adopt a variety along with ones they already have, it contributes to diversity on their farm. Scientists are also recognizing the value of farmer grown varieties of small millets, compared to released varieties, in terms of yield and adaptive characteristics, such as tolerance to drought and heavy rainfall, and disease resistance.



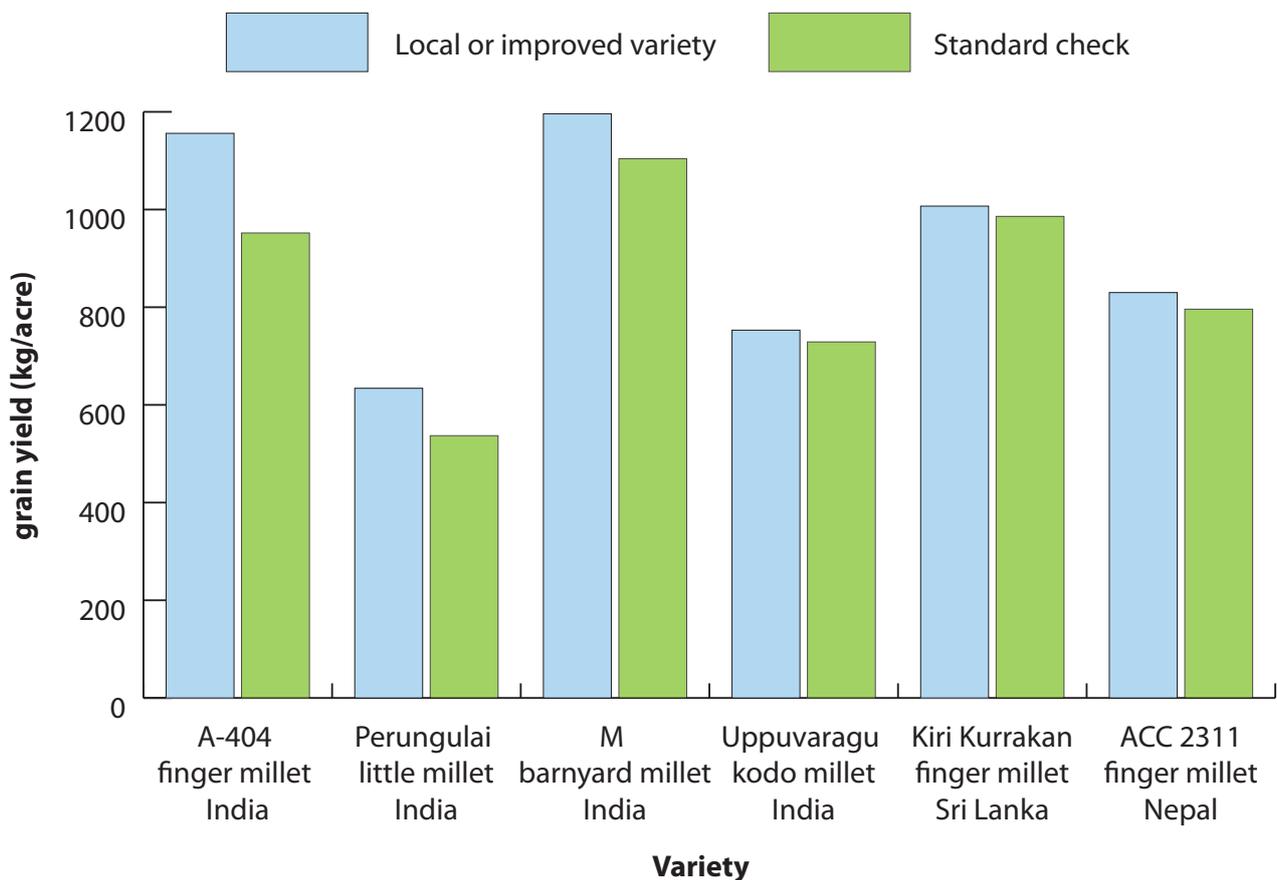


Figure 1: Potential increases in yield of small millet preferred varieties

Increased access to quality seed of promising varieties

Moving forward, seed production has begun for the varieties that were preferred by farmers in the trials. Identifying and training farmers to be seed producers is underway across the eight sites. Farmer organizations are also playing a role in seed distribution and are investing in the adoption of the promising varieties in their regions.

In Semiliguda, India, 1,600 kg of finger millet and little millet seed has been procured from farmers trained in quality seed production methods. This seed will be distributed to 1,000 farmers in this region. In Thanamalwila, Sri Lanka, an expected 3,600 kg of seed of four promising varieties will be procured in the coming season.

“ The project gave us a number of finger millet varieties. We selected better varieties and now we are cultivating those high yielding varieties along with our local variety.

W.A. Mangalika, female farmer from Suriya-ara, Thanamalwila, Sri Lanka



Recognition of preferred varieties is now in process, through registration of two identified varieties in formal seed production systems and four identified varieties in formal varietal evaluation systems. For example, in Nepal, one farmer-grown variety and one research station variety are being submitted to the National Seed Board. Approval will allow these varieties to be included in the formal seed chain. Registration will aid the distribution of quality seeds of the identified variety to farmers in other areas with similar agro-ecology.

Increased productivity for farmers in rainfed areas

Several of the preferred varieties of small millet (including research station and local varieties), offer between 15% and 20% increased yields, compared to prevailing varieties, and are well adapted to local environments (Figure 1). Multiplication and adoption of these higher yielding varieties means increased productivity.

In Dumbriguda, India, where finger millet is a staple crop used for home consumption, Srichiatanya, a released variety of finger millet,



Women farmer voting during PVS

was selected in the first year by the trial farmers due to its superior yield performance. In the second year, large-scale testing of this variety was undertaken with the participation of 3,000 farmers and the support of government.

“ We usually grow the Muttnakezhvaragu variety of finger millet. Last year we tried the GPU 28 variety for the first time, under our baby trial. To our surprise, we harvested 129 kg from 0.13 acres, while our usual variety gave only 27 kg for 0.07 acres. This is the first time we have got so much finger millet from a limited area. We are planning to grow the GPU 28 variety next year.

Amutha Puthur, female farmer from Nammiyampattu, Jawadhu Hills, India ”

Conclusion

These emerging outcomes are significant in terms of both product (farmers preferred varieties identified) and process (the PVS approach). PVS can speed up farmers' access to suitable varieties compared to conventional breeding and extension, and also gives farmers much wider choice in the varieties they plant. Through greater involvement in the research process, farmers disseminate promising varieties

through their own networks. The adoption of farmer-preferred varieties is already showing an increase in yield of 15% to 25% and some high-productivity traditional varieties with adaptive traits are now being spread to other areas. The selection process also has the potential to be scaled out to other locations.

In India, there are many large-scale programs for small millets, such as the Initiative for Nutritional Security Through Intensive Millet Promotion and state government programs. Results from the PVS trials can now be fed into these national and state programs, and can also feed into further research related to varietal improvement, including participatory plant breeding.

References

- IDRC. *Increasing Millet Production in South Asia*. <http://bit.ly/1noJtGB>.
- Varma, V. and Patel, S. (2013). Value Added Products From Nutri-Cereals: Finger Millet (*Eleusine coracana*). *Emirate Journal of Food and Agriculture*, 25(3): 169-76.
- Yenagi, N. and Mannurmath, M. (2013). *Millets for Food and Nutritional Security: Lead Paper*. National Seminar on Recent Advances in Processing, Utilisation and Nutritional Impact of Small Millets, Madurai, India. TNAU and DHAN Foundation, India.

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