



Fruit tree genetic diversity in Central Asia: Increasing value, managing threats

Our research aims to improve the management of globally important fruit and nut tree species in Central Asia to secure long-term livelihood options for rural women and men and safeguard commercially valuable resources.

The challenge

Central Asia is the centre of origin and diversity for many species of global importance, including fruit and nut trees. Wild populations of walnut, apple and apricot, among the most valuable species in the area, are under serious threat from global factors, such as climate change, and factors associated with rural poverty such as livestock grazing pressure. Overgrazing in fruit and nut forests is a result of farmers having insufficient land, resources and knowledge to manage their livestock in a sustainable way.

Our solution

Our research in Kyrgyzstan, Uzbekistan and Tajikistan, focuses on genetic and nutritional diversity of wild and semi-domesticated apple, apricot and walnut. We use molecular and biochemical analyses to understand patterns of diversity and gene flow among wild and home garden populations of each species. We are conducting social and biophysical research to understand and improve management practices to increase the long-term value to local women and men and alleviate the impacts of multiple threats from human activities. Social studies include gender analysis to understand the differences in management activities, approaches, understanding and needs of women and men.

Results

Our research shows high levels of genetic diversity for all species as well as high threat levels. Very little wild apricot remains in the three countries, but there are still relatively large walnut populations. Clear barriers to gene flow are apparent between populations of all species and genetic and nutritional differences are in evidence among the three countries. The region is not genetically homogenous for

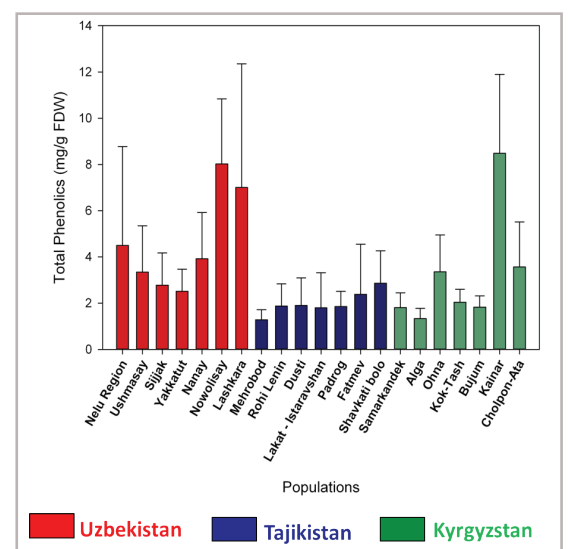


Figure 1 – Differences in total phenolic content (based on 11 phenolic compounds) in apricot fruit among sampled populations in the three study countries.

any of the species hence conservation strategies must be focused on each country as a separate gene pool. Walnut exhibits a high degree of gene flow between wild populations and home gardens, so although the wild populations all experience a high degree of threat, the gene pools are protected to an extent by the genetic reservoir in home gardens. This is not the case for the other two species where local varieties have been developed and there is much less exchange of genetic material between wild populations and gardens.

The relative importance of different threat factors varies among different species. Overgrazing is a serious and growing problem related to the poverty of rural communities, that affects walnut and apple. Spatial analyses using climate models and potential distribution of the three species calibrated by local experts indicate that apple and apricot are more sensitive to the impacts of climate change than walnut, which seems likely to be less influenced by warming temperatures in the near future. All three species are negatively affected by winter thaws followed by hard frosts which are likely to increase with changing climate.

Potential for impact

Capacity development is an integral part of our work. We collaborate with national research partners, including training a PhD student from each country, and have organized multiple training sessions at different levels ranging from high-tech molecular analysis to grafting walnuts in the communities.

Policy links have been made in all three countries through national partners

who are all in sufficiently high positions to bring key government officials into discussions when appropriate. We are developing 'Model Forest Farms' in two of the three countries to provide ongoing examples of management and conservation practices that will reduce the impacts of threats while securing long-term livelihood benefits. In Kyrgyzstan the project team has connected with policymakers via the Model Forest Farm, which is chaired by a former high-level government official who still has access to relevant policymakers and exerts direct influence on policy development in the country. The Model Forest Farm has been invited to apply for membership in the International Model Forest Network and Turkey is providing advice and assistance in working towards that

goal. This would significantly increase the potential to model sustainable management and conservation practices for the region and for the influence to continue to grow well beyond the life of the current project.

Communication products will target different audiences as well, ranging from a special issue of a local newspaper, describing the project and the aims of a Model Forest Farm, and a catalogue of local forms of walnut to allow farmers to improve their choices of planting material for gardens and orchards, to peer-reviewed scientific articles.

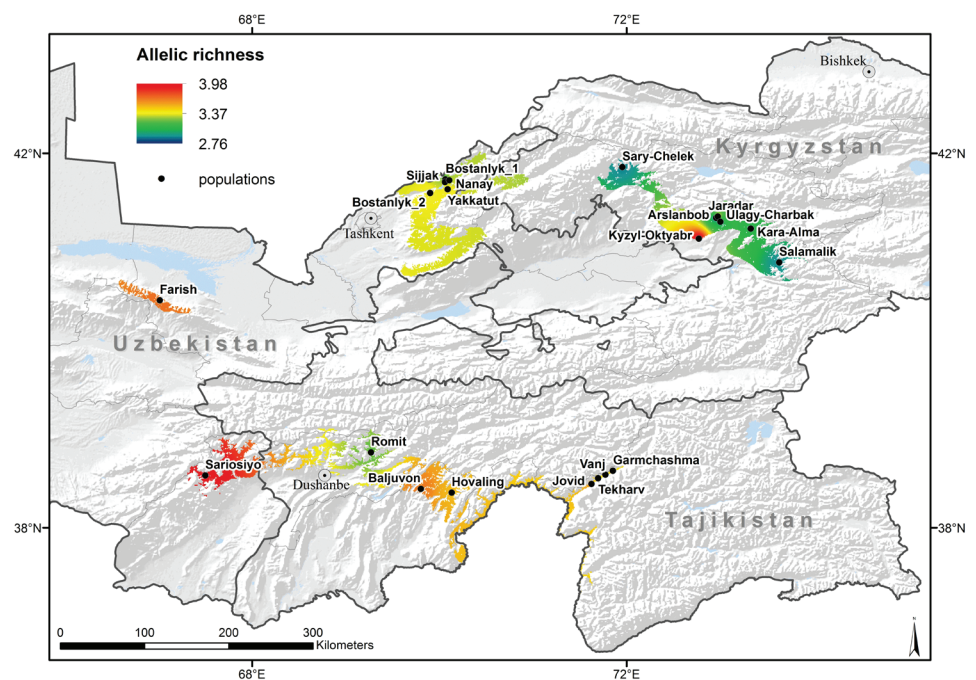


Figure 2 – Genetic diversity in terms of allelic richness of walnut populations in the three countries. Red indicates the highest diversity and blue the lowest. Credit: Bioversity International/H. Gaisberger

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