



Conserving Fruit Trees and Wild Berry Biodiversity in Northern Kyrgyzstan

Northern Kyrgyzstan is home to some of the richest agrobiodiversity of fruit trees and their wild relatives in Central Asia, and is the place of origin and domestication of many important crops, especially apples.

Numerous plant species are used locally for different purposes and provide an important basis for the sustainable development of local communities (**Figure 1**).

Fruit from flowering plants and berries are also important for a healthy diet. However, the spread of new diseases, lack of basic cultivation and grafting knowledge among farmers, and the current economic situation are all factors threatening fruit tree and wild berry biodiversity. Today this unique genetic diversity of fruit cultivars and their wild relatives is endangered.

Key Recommendations

- Create additional economic incentives for farmers to maintain biodiversity, with new products from traditional fruit trees.
- Increase fruit farmers' use of native fruit tree species by increasing horticultural knowledge (e.g. grafting techniques).
- Improve fruit farmers' access to diverse botanical options, through establishment of local nurseries with demonstration gardens.
- Increase fruit farmers' ability to protect trees from disease through improving skills and encouraging use of biological controls.
- Increase knowledge about the nutritional value of native fruit cultivars and wild berries and their potential contribution to protect biodiversity and to improve health.

Loss of biodiversity caused by changes in the economic system

With national independence in 1991, the economic system in Kyrgyzstan changed radically and agriculture became the primary source of income for most rural residents. Traditional livestock herding decreased dramatically, and most farmers began to sell fruit and berries from their gardens and orchards. In the 2000s farmers saw the commercial benefit of cultivating and selling fruit, including berries, and slowly reoriented their activities towards maintaining existing orchards and establishing new ones.

However, in mountainous regions in Northern Kyrgyzstan, there is limited fertile land and a deficit of irrigation sources. Farmers therefore conserve fertile land for productive fruit trees and berries, cutting down old, non-commercial or diseased trees and wild berry shrubs. In place of these, farmers cultivate commercial fruit and berry cultivars. Previously the Duchesse (Дюшес; *Pyrus communis*) pear cultivar was used for eating fresh and even for preparing homemade alcohol (Figure 1). But despite its excellent taste, this cultivar has almost been lost over the past 15 years. Its fruits are no longer in demand because they are not transportable and do not keep well when stored.

Fruit farmers play an important role in regulating local biodiversity. Providing viable economic options for traditional fruit varieties could encourage local farmers to maintain this agrobiodiversity. Alternative products can be made from fruit and berries, which could provide additional income during the non-harvest season. Small, local enterprises (e.g. women's cooperatives) could provide several people with household equipment for preparing products (e.g. candied fruit, marmalade, teas, dried fruit).

Increasing knowledge of fruit husbandry and orchard management

Horticulture was not historically practiced by the semi-nomadic Kyrgyz peoples. The first fruit cultivars were brought to Northern Kyrgyzstan by Russian immigrants, and later horticulture was undertaken mostly by Russian and Dungan farmers. However, most Kyrgyz farmers now have basic knowledge and skills in fruit husbandry.

After the dissolution of the Soviet Union, a rural exodus within Kyrgyzstan and large-scale migration from Kyrgyzstan to other countries saw many young people leave agricultural areas. This has led to a loss of agricultural knowledge and experience in fruit tree cultivation. Today, many rural young people prefer to pursue business activities in areas other than agriculture. As a result, information is not passed down from older generations to the young, and farmers' traditional knowledge is being lost.

Therefore there is a need to increase farmers' knowledge of horticulture skills to help preserve biodiversity. Farmers could benefit from workshops that teach the value of biodiversity, and how it can be maintained (Figure 2). For example, workshops could describe the biodiversity of local fruit crops and their capacity to resist drought, frost, diseases and pests; "green" agricultural cultivations; organic preparates to protect from insect and pests; biofertilizers; drop irrigation; and

composting.

Increasing farmer's access to planting materials

There is no state-regulated system in Kyrgyzstan for producing plant material or seedlings of fruit and berry cultures. Private nurseries bring the material to Kyrgyzstan from several other countries without systematic analysis of quality, and do not produce the seedlings of local cultivars. Therefore most local farmers do not have access to planting materials of local fruit cultivars, and they do not know how to grow fruit crops from seed.

The creation of small village nurseries would be an important step to obtain, develop, and preserve planting materials of local varieties of fruit crops. Fruit farmers would also be able to access reliable quality grafting material for planting local varieties of fruit crops through these nurseries. Similarly, the establishment of community-based field collections (gardens) of local varieties of fruit crops, e.g. on the territory of local schools, hospitals, ail-okmoly (local government), and kindergartens, could help young people to gain knowledge about different varieties of fruit crops.

Preventing the spread of new diseases

During the last 15-20 years, Kyrgyzstan has seen uncontrolled import of fruit and plant material from many countries. This has made it difficult to control the introduction of pests and diseases into private gardens and nurseries.

Between 2012-16 many fruit orchards in Kyrgyzstan's Issyk-Kul region were infected by fireblight (*Erwinia amylovora*), a disease which can cause the rapid death of entire orchards. Young branches and leaves turn black, then curl, and this process spreads rapidly down the tree. The disease affects immature fruit in the same way (Figure 3). Apple trees in the region have also been infected by scab (*Venturia inaequalis*). This affects leaves and fruits, giving them an unattractive shape and reduced vitamin content. Scab also results in lower productivity (reduced number and weight of fruit) and lower fruit quality.

Spreading information about disease prevention could assist farmers to protect their fruit trees, and local biodiversity. Important knowledge includes information on how to guard orchards from pathogens, knowledge of disease symptoms, skills to grow sterile planting material from seed, and how to use wild apple or pear trees to graft introduced cultivars.

Improving knowledge about the nutritional value of wild berries

Rural populations in Northern Kyrgyzstan have little access to information sources such as the Internet or public libraries. Despite epidemic proportions of anaemia among women and children in Kyrgyzstan, which vitamin-rich fruits and berries could help to decrease, affected communities have little knowledge of this. The theme of nutritional value of wild berries, vegetables and fruits is also not popular in the media.

As a result, local communities in Northern Kyrgyzstan often have a poor understanding of the links between diet and health status. For example,



Figure 1: A fruit farmer with his Duchesse pear tree, a local cultivar which has almost been lost.

Photo: Gulmira Sariyeva



Figure 2: Traditional varieties of fruit trees are being cut down to make way for more economically productive varieties. Grafting other cultivars onto an established traditional fruit tree can preserve biodiversity and speed up fruit production. Here, the apple cultivar Saffron and the pear Talgarskaya krasaviza have been grafted onto an established tree of the local variety Kyrgyz zimneye, in the garden of a farmer in the Ak-Suu village. Few fruit farmers know how to graft.

Photo: Gulmira Sariyeva

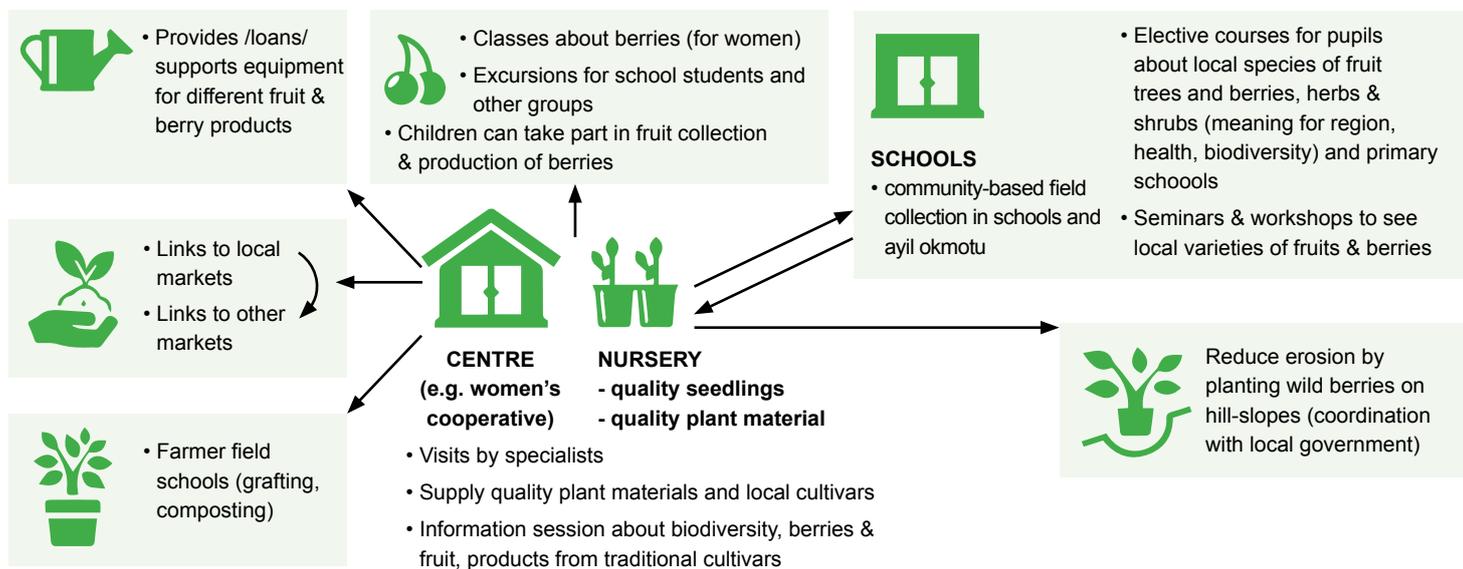


Figure 3: Fruit farmers in Dzhetty-Oguz village show pears affected by an unknown pathogen. This may be fireblight (*Erwinia amylovora*).

Photo: Gulmira Sariyeva

of all the wild berry and nut plants that are native to the region, only a handful of farmers grow walnuts in their gardens, even though most know of the walnut's nutritional value. The main factor for this is lack of information about agro-techniques for walnut cultivation and a deficit of land, as nut trees require large areas to grow. Similarly, most women know about the medicinal properties of wild black currant, sea buckthorn and barberry, but few use them for this purpose – mainly because of the prevalence of introduced cultivars (black currant and raspberries).

Improving knowledge about the nutritional properties of wild berries could increase peoples' appreciation of their value, and encourage the use and protection of these species. This may be achieved through holding seminars for women, youth and children on the nutritional value of local fruits and berries and the relationship between diet and health status. School courses could educate about the local diversity of fruit crops, their varieties and wild relatives, and why they need protection. Farmers and local government could also work together to create plans to protect these species. Further research would help to understand more specifically the nutritional values of wild fruits and berries and the norms of consumption of fruit (local versus introduced species) in order to promote biodiversity.



Case Study: Local Knowledge of Fruit Trees in the Issykul Region

In order to understand the biodiversity of fruit trees and wild berries in the Issyk-Kul region, CAARF fellow Gulmira Sariyeva conducted interviews with local fruit farmers in ten villages of the Dzhetty-Oguz and Ak-Suu sub-regions (rayon) where agriculture is the major occupation (Figure 4). In particular, she was interested in the specific diversity of fruit trees, nut and berry crops and their wild relatives.

Focus group discussions were conducted with groups of women, men, and village leaders, and included farmers, agronomists, teachers, medical personnel and local government officials. Participants were asked about the fruit cultivars that they knew and used, why species

were being lost, the plant materials they use for their orchards, how they reproduce and renovate orchards, and their use and knowledge of wild berries.

Farmers noted reasons for the loss of cultivars (Table 1) and described plant materials from private nurseries or bazars (the only source of plant materials) as often being of unreliable quality. Many farmers knew theoretically about grafting but did not practice it, and few farmers knew about biofertilizers, drip irrigation, protecting trees against diseases and insects, or about the nutritional value of wild berries. In the last 3-4 years many pear trees had died because of an unknown pathogen.



Figure 4: Focus group discussions with fruit farmers in Ak-Kochkor village, September 2015.

Photo: Gulmira Sariyeva

Number of varieties	Number of traditional (local) varieties	Distribution of traditional varieties	Vitamin C content	Vitamin A (retinol) content	Reason for disappearance	Use
Apple						
24	17	Low	Aport (local) – medium Starkrimson – medium Zolotoy Ranet (local) – medium	Low Low Low	Not transportable - no commercial demand, cannot be stored over the winter period, sensitive to diseases, no available plant material	Eating fresh, juice, marmalade, jelly
Apricot						
9	5	Low to medium	No data	No data	Not transportable - no commercial demand, no available plant material, tart taste, no knowledge about nutritional value	Eating fresh, juice, marmalade, jelly, use of cores in food

Number of varieties	Number of traditional (local) varieties	Distribution of traditional varieties	Vitamin C content	Vitamin A (retinol) content	Reason for disappearance	Use
Pear						
3	2	Almost lost	Dushesse (local) – low	Low	Not transportable - no commercial demand, no available plant material	Eating fresh, juice, marmalade, jelly,
Walnut						
1	1	Low	No data	No data	Deficit of land, no knowledge about agrotechniques	Fresh eating, storage for eating
Wild berries						
Kalina (<i>Viburnum opulus</i>)	Dzhety-Oguz and Ak-Suu populations	Medium	High	Very high	Non-controlled grazing of cattle	-
Wild currant (<i>Ribes nigrum</i>)	Dzhety-Oguz and Ak-Suu populations	Low	No data	No data	Non-controlled grazing of cattle, cutting for firewood	Fruit tee, jam, drying
Barberry (<i>Berberis vulgaris L.</i>)	Dzhety-Oguz and Ak-Suu populations	Medium	Very high	Very high	Non-controlled grazing of cattle, cutting for firewood, burning to liberate territory by ploughing	Kompot (boiled fruit juice), tincture, cordial
Seabuckthorn (<i>Hippophae rhamnoides</i>)	Dzhety-Oguz and Ak-Suu populations	Low	No data	No data	Non-controlled grazing of cattle, cutting for firewood, non-controlled collection for selling berries by breaking branches, burning to liberate territory by ploughing	Jam, oil
Dog-rose (<i>Rosa canina L.</i>)	Dzhety-Oguz and Ak-Suu populations	Low	Very high	High	Non-controlled grazing of cattle, cutting for firewood, burning to liberate territory by ploughing	Tincture, kompot

Further Reading

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Mountain Societies Research Institute

The University of Central Asia Graduate School of Development's Mountain Societies Research Institute (MSRI) is an interdisciplinary research institute dedicated to addressing the challenges and opportunities within Central Asian mountain communities and environments. MSRI's goal is to support and enhance the resilience and quality of life of mountain societies through the generation and application of sound research.

MSRI has five objectives: To generate knowledge on mountain societies through original scientific research; to serve as a knowledge hub for scholars, development practitioners, and policy makers; to enhance regional capacity to conduct sound research relevant to mountain societies; to inform policy and practice through engagement with key development partners; and to disseminate knowledge among mountain stakeholders, including the co-development and co-teaching of UCA's academic programmes. MSRI, together with its partners, actively works to transfer knowledge to policy and practice aimed at improving the quality of life for people of the mountain areas in Central Asia. For more information on MSRI, please visit: <http://www.ucentralasia.org/msri>.

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