



## Case Study:

### Nurturing Knowledge: Medicinal Plants in the Pamir Mountains of Afghanistan and Tajikistan

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**Country:** Kyrgyzstan

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Cornell University



## **Nurturing Knowledge: Medicinal Plants in the Pamir Mountains of Afghanistan and Tajikistan**

**Karim-Aly Kassam, Michelle Baumflek, Morgan Ruelle, and Munira Karamkhudoeva**

### **Introduction**

Medicinal plants are integral components of health care systems throughout the world. At least 35,000-52,000 plants (of an estimated 300,000 species worldwide) have been used by humans as medicines (Perry, 1980; Farnsworth & Soejarto, 1991; Balick & Cox, 1996; Moerman, 1998; Kapoor, 2001; Sheng-Ji, 2001; Hamilton, 2004). In the United States, Canada, and much of Europe, medicinal plants are now often considered to be an alternative form of treatment. Yet for some communities within these countries and in many other parts of the world, they continue to play a primary role in human health. Even where people have access to hospitals, they often choose to use medicinal plants for a number of reasons. Many believe that medicinal plants are effective alternatives to pharmaceutical drugs that incur unwanted side-effects. The use of plants is imbued with cultural meaning, including connections to spiritual dimensions of health and well-being, making them a preferred form of treatment. Plants have been used as medicine throughout history, compared to the relatively recent dependence on pharmaceutical alternatives. Plant use directly links people with their local ecosystems.

The use of medicinal plants requires sophisticated knowledge about their use and conservation. Knowledge of medicinal plants develops from the cumulative experiences of cultures that gather, grow, and use them. In Europe, the science of botany emerged from the study of medicinal plants. Other well-known examples of knowledge systems based on medicinal plants include Chinese traditional medicine and Indian Ayurvedic medicine. In fact, the Linnaean taxonomic structure was influenced by the practice of indigenous medicine in India and south-east Asia (Ellen & Harris, 2000, p. 10; Kassam, 2009a, p. 39, see endnote 10). Carl Von Liné drew heavily from these Ayurvedic and Malay systems of knowledge and categorization which in turn informed his understanding of classification of plants before it became canonical in modern botany. Medicinal plants are also the basis of many familiar tablet- and injection-based medications that we use today. Some prominent examples include aspirin, which was developed from the bark of willow trees, and taxol, an anti-cancer drug which is made using compounds isolated from the Pacific Yew tree. In a sense, the modern pharmaceutical industry is a continuation of a long human tradition of plant use taken to large-scale production and profit-making<sup>1</sup>.

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<sup>1</sup> By emphasizing medicinal plant use, we are not rejecting or diminishing the importance of medicines produced by the pharmaceutical industry because they are clearly important to human health. This video and case study simply highlight the ongoing and significant role of indigenous knowledge of medicinal plant use to human health and biodiversity conservation.



This case study focuses on the knowledge and use of medicinal plants in the Pamir Mountains of Afghanistan and Tajikistan. The specific objectives of this case study are to illustrate how plants are central to human wellbeing, how food and medicine are interrelated, and how knowledge of plants can contribute to biodiversity conservation. The authors have collectively conducted more than a decade of research in 114 villages in both the Afghan and Tajik Pamirs. Conversations with villagers and nomadic pastoralists throughout the Pamirs reveal that medicinal plants enable these communities to determine their own healthcare systems, especially under conditions of dramatic ecological and social change. After providing a brief history of the Pamirs, we will introduce the notion of health sovereignty in relation to medicinal plants. We will then discuss the significance of medicinal plants through an analysis of plant knowledge in the Pamirs. Finally, we consider the future of medicinal plants in the Pamirs and the role of ecological knowledge for plant conservation.

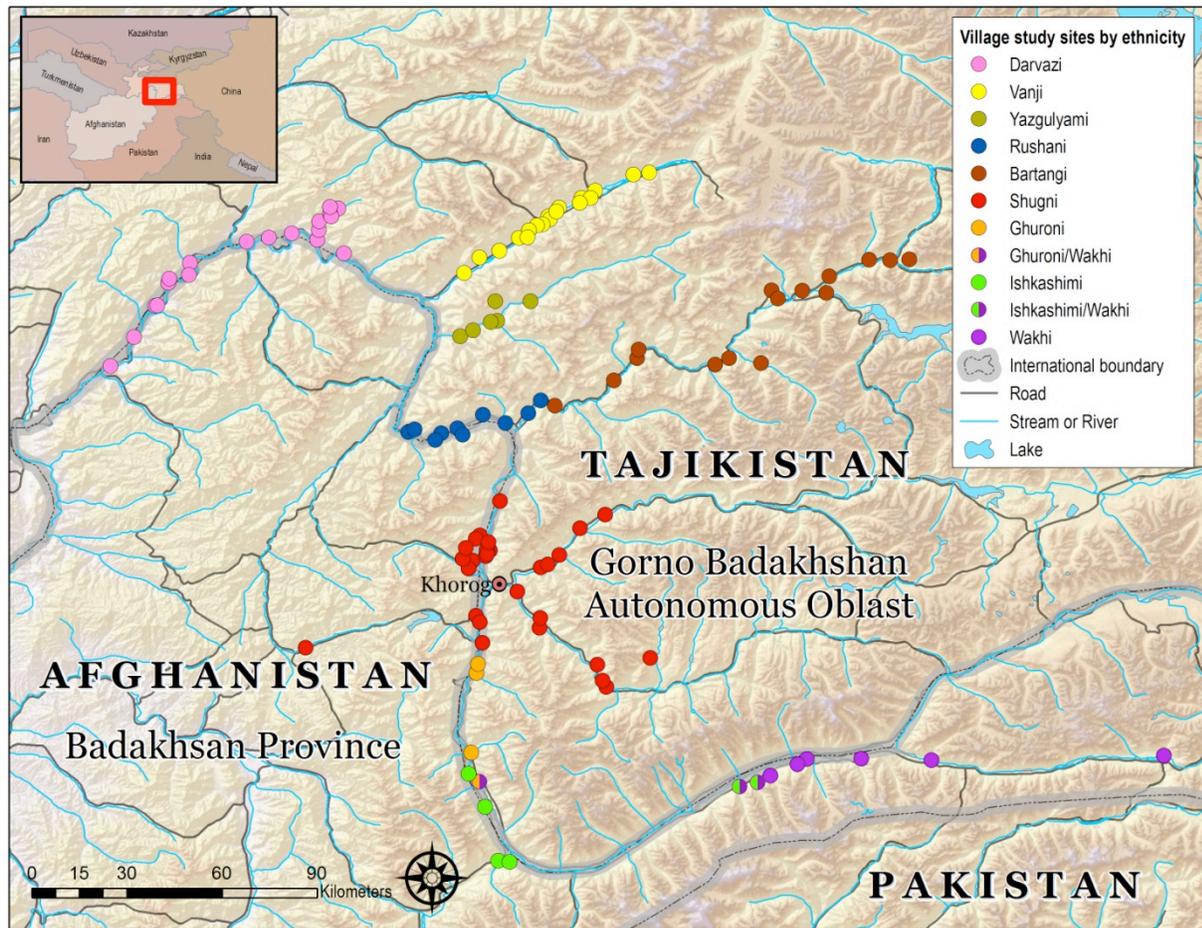
### **Biocultural Diversity in the Pamir Mountains**

Known as the “Roof of the World”, the Pamirs are among the highest mountains on Earth, reaching 7,495 m (24,590 ft) above sea level. The Pamir Mountains are a place of remarkable biocultural diversity. For thousands of years, people have both shaped and been shaped by interactions with this dramatic landscape. Studies of the vegetation indicate that the Pamirs are home to approximately 2,000 plant species, of which 8% are endemic (Agakhanjanz & Breckle, 2002, 2003). For hundreds of generations, Pamiris have enhanced plant diversity throughout their landscape, carefully managing numerous varieties of fruit, vegetable, and grain crops, and protecting and promoting non-cultivated plants that they know how to use.

The Pamirs are marked by considerable linguistic, cultural, and religious differences among the people of their different valleys (Shahrani, 1979; Kreutzmann, 2003; Bliss, 2006; Middleton & Thomas, 2008; Nabhan, 2009; Kassam, 2010) (see Figure 1). The northern districts of Vanj and Darvaz practice Sunni Islam; their language is Tajik, except in the Yazgulom Valley, where the Yazgulomi dialect is spoken. People of the Districts of Rushan, Shugnan, Roshtkala, and Ishkashim are Ismaili Muslims; Shugni is understood in most of these districts, but many people in Ishkashim speak Rehne and Wakhi, as do their neighbors across in the Wakhan Corridor and in northern Pakistan. Rushan and the Bartang Valley also have their own dialects. In the eastern high plateau of Badakhshan, the population is mainly ethnic Kyrgyz and Sunni Muslim. On the Tajik side, the Kyrgyz in Murgab were essentially nomadic herders who were sedentarized in the 1950s, while on the Afghan side a small group of Kyrgyz continue nomadic activities.



**Figure 1: Villages in the Pamir Mountains are marked by considerable cultural diversity.**



### History of the Pamirs

The strategic location of the Pamirs along trade routes in Central Asia has made it a nexus for the exchange of not only goods and services but also ideas and innovation, including plants and associated ecological knowledge. In the second century BCE, Chinese envoys to Central Asia established trade networks that soon extended from East Asia to the Mediterranean. These networks, which were later referred to as “the Silk Road”, linked the Pamirs to Japan, China, India, the Middle East, and Rome. Despite misperceptions of the Pamirs as remote and isolated, they in fact benefited from sustained trade and intellectual exchange. Pamiri knowledge related to plants, including that of plants originating in other regions, reflects long-standing connectivity with other parts of the world.

Due to their strategic location along major trade networks, the Pamirs were the target of invasions from Persia, Arabia, China, and Mongolia, and since the nineteenth century, the Pamirs have attracted the imperialist attentions of European and American powers. Most of Central Asia was under Persian influence until the Arab invasions in the seventh century CE. The Umayyad and Abbasid caliphates and the Fatimid religious and cultural ethos contributed to a flowering of pluralistic Islamic thought in



Central Asia (Daftary, 1990; Hunsberger, 2000; Middleton, 2003). The armies of these Arab dynasties repelled the westward advances of the Chinese Tang dynasty. In the ninth and tenth centuries, the Samanid dynasty introduced Persian-Islamic influences to the region. Just before the turn of the first millennium, the Samanids fell to the Turkic Ghaznavids, and for the next several centuries, the Pamirs were joined to a series of Turkic and Mongolian states.

In the nineteenth century, tsarist Russia and Britain began to compete for control of Central Asia in what became known as the “Great Game” (Bliss, 2006; Middleton & Thomas, 2008). The Pamir Convention of 1895 split the Pamirs between two spheres of influence: the British in Afghanistan west of the Panj River, and the Russians in Tajikistan to the east. Following the Russian Revolution in 1917, several Central Asian groups attempted to win their independence from Russia, but the Soviet Union maintained control of the entire region. In 1924, Stalin demarcated new Soviet Republics in such a way as to maintain a mix of ethnic groups, anticipating that tensions between groups would justify his centralization of Soviet power. Tajikistan, including the Pamirs east of the Panj River, became a federated Soviet Republic in 1929 (Middleton, 2003). Throughout this period, the Pamirs west of the Panj were ruled by a series of Afghan monarchs supported by the British.

The great Russian botanist Nikolai Vavilov conducted some of his earliest work in the Pamirs, which he determined to be a part of a center of origin for several important cultivated grains and legumes. Vavilov visited the Pamirs at least twice (in 1916 and 1924), and later described how farmers over multiple generations had succeeded in developing crop varieties adapted to a wide range of local conditions (Loskutov, 1999; Nabhan, 2009). During Soviet occupation of the Tajik Pamirs, agricultural activities were altered from production for self-sufficiency to production at an industrial scale by means of forced collectivization, mechanization of agriculture, and sedentarization of nomadic peoples. As a result, local seed varieties of grains and fruits and the know-how to cultivate them were lost in some regions, potentially diminishing food security (Nabhan, 2009) and compromising healthcare options. Nonetheless, some regions of the Tajik Pamirs retained their medicinal plant knowledge despite Soviet collectivization. By comparison, on the Afghan side of the border, local agro-pastoral knowledge continued to sustain livelihoods, and small-scale production prevailed. The contrast in socioeconomic conditions on the two sides of the Panj River was stark. The Soviet side benefited from education and healthcare services and received supplies of fuel, food, and consumer goods. On the Afghan side, physical and institutional infrastructure such as roads, healthcare, education, and electricity were limited, if not entirely absent (Felmy & Kreutzmann, 2004; Bliss, 2006).

In 1979, a military coup seized power in Afghanistan, leading to armed rebellion throughout the country and the invasion of Soviet forces. The Pamirs became a major deployment point for the Soviet military. As part of its Cold War strategy, the United States and several allies funded anti-government *mujahideen* fighters. By 1989, Soviet troops had withdrawn from Afghanistan and the United States had ended its support for the resistance, leaving Afghanistan in a state of civil war. In 1995, the Taliban, with support from Pakistan and Al Qaeda, seized the capital city of Kabul. The Afghan Pamirs remained under the control of the United Front (or Northern Alliance) until 2001,



when the September 11<sup>th</sup> attacks provoked the invasion of Afghanistan by the United States. A new government led by Hamid Karzai still includes members of the Northern Alliance, who hold key positions in Badakhshan and other northern provinces.

In the Tajik Pamirs, following the collapse of the Soviet Union in 1991, living conditions quickly deteriorated. A civil war between former Soviet appointees and their political opponents lasted from 1992 to 1998. During the war, villagers depended heavily on humanitarian aid for survival. In late 1993, when self-sufficiency was just 15%, the local government distributed unused or under-utilized farmland to villagers who wished to become private farmers. Village by village, the lands of the former *sovkhoses* (collective farms) were distributed equally to every household, including many who lacked traditional farming knowledge because of division of labor in the previous agricultural system. Farming families who had become state employees needed to learn how to farm again. Some farming households received improved seeds and fertilizers on credit from the Mountain Societies Development Support Programme (MSDSP) (Kassam, 2009b).

The “new great game” (Kleveman, 2003) continues to be played out as complex political alliances compete for military and economic dominance. Now, not only are the traditional rivals of the Cold War participating, but China, India, Iran, Pakistan, and Turkey are also exerting their strengths as regional powers. For example, China is expanding its role in the region as a key provider of development assistance, primarily in the form of preferential loans to Central Asian Republics, like Tajikistan, that lack strong physical and institutional infrastructure (International Crisis Group, 2009). Energy supplies such as oil, natural gas, and hydropower drive this new game (Goodson, 2001; Rashid, 2002; Kleveman, 2003; Bliss, 2006). The national boundaries in the “new great game” continue to divide the people of the Pamirs (Kassam, 2009b). The current situation may serve as a barrier to restoring health sovereignty on both sides of the border.

### **Health Sovereignty in the Pamirs<sup>2</sup>**

Health sovereignty is the ability to choose medicines that are socio-culturally appropriate and ecologically relevant, providing practical, reliable, and contextually relevant healthcare options (Kassam *et al.*, 2010). Interviews conducted in 114 villages throughout the Tajik and Afghan Pamirs gives us a sense of the contribution medicinal plants to health sovereignty. As in many other parts of the world, use of locally-available medicinal plants continues to be the primary healthcare option in the Pamirs. While the number of patients at local hospitals is increasing, many of the villages are remote, and require multiple-day trips to reach a clinic or hospital. Furthermore, clinics may not always be adequately supplied or staffed due to political instability, road conditions, weather events, and more. However, plants that are readily available from local ecosystems provide culturally appropriate and ecologically relevant options for health (Etkin & Ross, 1982; Alcorn, 1995; Kassam *et al.*, 2010)

The availability of local medicinal plants does not by itself ensure health sovereignty; knowledge is also essential. In order for Pamiri people to use plants,

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<sup>2</sup> Primary material presented in this and the following section has been adapted from Kassam *et al.* (2010).



villagers must maintain knowledge about plants and how to use them. This knowledge reflects the cumulative experiences of multiple generations of Pamiris using plants. At the same time, ecological knowledge is not homogenous or static. Individual Pamiris know how to use different plants in different ways. Although healers like Shozodaev Bozicha (in the supporting video) have specialized knowledge about plants, other community members may hold different knowledge about plants. Furthermore, Pamiris are constantly adapting their knowledge to new social and ecological conditions, based on new experiences and resulting from conversations with each other. For instance, information about the use of medicinal plants is shared between practitioners for mutual benefit. People throughout the community visit and consult with women and men who are engaged in medicinal plant collection and preparation. Knowledge about plants is also transferred to younger family members, which illustrates its vitality and continued relevance.

As seen in the video supporting this case study, the use of medicinal plants requires knowing how to locate, identify, collect, prepare, use, and store medicinal plants. As illustrated in the video, the healer first decides which plants are needed for a particular treatment. Next, she or he needs to know where those plants grow, which involves being able to discern between different habitat types. In the Pamirs, habitats include alpine and subalpine semi-deserts and deserts, mountain steppes and meadows, krummholz (dwarfed forests), juniper woodlands and forests, broad-leafed forests, river meadows, orchards, fields, and gardens (Agakhanjanz & Breckle, 2003; Breckle, 2007). Some medicinal plants, including lemons and garlic are cultivated in croplands, orchards, and gardens; other medicinal plants, including apricots and apples, grow in a variety of habitats where they are tended by gatherers and are sometimes transplanted into cultivated areas. In fact, apricots and apples trees are often brought from their montane habitats to cultivated places such as orchards.

Pamiris need to be able to distinguish the plant they want to use from other plants in the same habitat. Some useful plants have look-alikes that are poisonous, so community members have to know how to differentiate between those plants. Interviews with villagers reveal at least 58 different plants that are used for medicine, and there are likely many more. Although villagers classify these plants differently, they represent 27 botanical families.

After identifying a plant, community members need to know which parts of the plant are useful. Of course, this differs from plant to plant and depends on the intended use. For many plants, multiple parts are useful, including roots, flowers, leaves, fruit, wood, and bark. Specific plant parts need to be collected at specific times of year. Many plant parts are only available in certain seasons, such as the calendula and tansy flowers collected by Shozodaev Bozicha in the video. In many cases, the medicinal properties of plant parts are known to be most effective at some optimal time of year. Finally, many people choose to collect plants when it will cause the least impact on the plant population. For example, many plants are not collected until after they flower and set seed, which allows the plant to propagate future generations. In the Pamirs, most plants are gathered or harvested in late spring through autumn, with the highest number of medicinal plants available in July, August, and September. The largest variety of non-cultivated plants is gathered in July, while



the majority of cultivated medicinal plants are harvested in September. This difference may indicate time allocation by participants (e.g., there is less time to gather non-cultivated plants during the agricultural harvest season), and may also reflect the reality of species availability throughout the year. The fact that most medicinal plants are gathered from spring through fall means that steps need to be taken to ensure their preservation for the winter.

After collecting a plant, community members must have knowledge about preparation, use, and storage. They must know precisely how to prepare an effective medicine from the plant, (e.g., a tea, salve, or tincture). In the Pamirs, many medicines are made by blending different plants together. Once they have prepared the medicine, healers need to know how it should be used for treatment, including how much, how often, and for how long the medicine should be used. Cumulatively, the 58 plants mentioned by Pamiri villagers have at least 310 distinct uses, which can be sorted into 63 categories of medicinal treatment and prevention. The largest plant usage categories (in terms of the number of plants that fall within them) are: gastrointestinal aids (31 plants), dermatological aids (18 plants), kidney aids (15 plants), analgesics (13 plants), liver aids (13 plants), and hypotensives (10 plants).

The frequency of specific medicinal plant use categories correspond with the most common causes for hospital visits in the Tajik Pamirs (Aga Khan Foundation Tajikistan, 2008). The most common reasons are: acute respiratory infections (which correspond to seven pulmonary aids and seven respiratory aids), digestive organ diseases (which correspond to 31 gastrointestinal aids), heart problems (which correspond to eight heart medicines), injuries/trauma (which correspond to 13 analgesics, six orthopedic aids, and eight treatments for cuts, bruises and wounds), and kidney diseases (which correspond to 15 kidney aids). This correspondence implies: first, that the diversity of knowledge within a specific plant usage category (as demonstrated by number of plants used for the same purpose) is indicative of the frequency of related medical conditions in the Pamirs, and second, that medicinal plant knowledge is highly relevant to the health sovereignty of the Pamirs.

In addition, the ability to use many different plants to treat a specific medical concern is important for Pamiri health sovereignty. It creates functional redundancy, meaning that if a particular plant is unavailable, other plants may be used instead. For example villagers described how *zarchoy* (*Rhodiola gelida*) became popularized as an energy enhancer and it began to be overharvested. In that case, six other plants are known to the communities as energy enhancers, and those can be used instead in order to protect populations of *zarchoy*. The diversity of treatment possibilities also contributes to health sovereignty by enabling individuals to choose the most appropriate treatments.



Finally, because many plants are not available throughout the year, Pamiris need to know how to store them for future use. In the video, we see how Shozodaev Bozicha has gathered and dried flowers so that he can use them during the rest of the year. The processes of drying (often in direct sun or under an awning) and storing are key elements of health sovereignty. Drying and storing plants allow Pamir communities to have the majority of their medicines available year-round (see Figure 2). At least 64% of

**Figure 2: Drying plants, such as mint (*Mentha asiatica*) allows Pamiris to have access to medicinal plants throughout the year.**



Pamiri medicinal plants are dried to increase storage time. The long storage length of certain plants allows for a certain degree of flexibility in timing of use, implying capacity for health sovereignty. The effects of environmental degradation and the impacts of climate change, including increasing uncertainty in ecosystem processes and more frequent cycles of unfavorable weather may be mitigated by these storage processes. Stores of medicinal plants may also play an important role during social instability, periods of civil unrest, or war.

### **Food is Medicine**

The majority of medicinal plants used in the Pamirs (62%) are also used for food. Distinguishing between the use of plants for food and medicine may be misleading, since many plants are known to provide both nutritive and other medicinal benefits (Sundriyal & Sundriyal, 2004). The etymology of the word “medicine” reveals that it is defined in relation to disease, whether used for treatment or prevention. Diseases are likewise recognized based on specific cultural values and norms. In contexts where diet-related conditions are considered diseases, food is an important category of medicine to provide effective treatment and prevention. The notion that “food is medicine” is widely held among indigenous communities globally (Etkin and Ross, 1982; LaDuke, 2005; LaDuke et al., 2010). As a result of colonialism, many indigenous communities experience rapid changes to their food systems, leading to disproportionately high rates of diet-related diseases. In addressing these and other diseases, distinguishing between food and medicine may not be appropriate.

In the Pamirs, the notion that food is medicine is critical to address malnutrition, which is a serious and prevalent condition throughout the region (Aga Khan Foundation Tajikistan, 2008). In Afghan Badakhshan, malnutrition contributed to the highest



maternal mortality rate ever reported (2005), 6,500 maternal deaths per 100,000 live births (Smith & Burnham, 2005). A 2007 household survey conducted by the Aga Khan Foundation in the Tajik Pamirs revealed that 32% of children under the age of five were classified as chronically malnourished. Specific micronutrient deficiencies were also widespread. For instance, anemia was epidemic in the population: 81% of children and 99.6% of women were found to be anemic to some degree. Villagers know how to use many medicinal plants (including as food) to reduce malnutrition, including to treat and prevent anemia. Medicinal plants that are food can therefore play an important role in improving human health in the Pamirs.

Conversations with Pamiri villagers indicate that uses of plants for food and medicine are interrelated in various ways. First, in some cases, villagers make no distinction between the use of plants as food and medicine (see Figure 3). For example, villagers explained that regular consumption of apricots can treat and prevent high blood pressure and heart disease. Similarly, they use apples to treat anemia and constipation, and to enhance appetite in addition to providing vital nutrients and vitamins. Second, a plant is sometimes prepared differently for its use as either food or medicine. The leaves, stems, and seeds of *Anethum graveolens* (dill, xarbit), for example, are chopped and added fresh to flavor many foods, but are also prepared as a decoction to treat pain in the spine, kidneys, and bladder. Third, villagers sometimes use a different part of a plant to prepare medicine than they use as a food. For example, Pamiris mill wheat grains to prepare flour for bread, but a decoction of wheat stems and honey is consumed to relieve inflammation of the upper respiratory tract or to cure a deep cough.

**Figure 3: Pomegranates (*Punica granatum*) are among the plants in which villagers make no distinction between food and medicine.**



Of course, a significant number of plants are used as medicine but not as food, particularly those that are used externally for salves and other treatments. In other words, we find that food is generally considered medicine, but not all medicines are considered food. Medicinal plants as a category include most (if not all) food plants, but foods and other medicines may be distinguished by their use and perceived benefits.



### **Conclusion: Conservation of Knowledge and Diversity for Health Sovereignty**

In the Pamir Mountains, indigenous knowledge of medicinal plants is fundamentally dependent on its use. This knowledge of medicinal plants is not only retained in people's minds, but in their relations with their habitat. In other words, medicinal plant use must be practiced in order for knowledge to be maintained. This knowledge is critical for health sovereignty and for the adaptation and resilience of Pamiri communities under conditions of socio-cultural and environmental change.

However, as healthcare systems are industrialized, people often use medicinal plants less frequently, and critical knowledge is lost. This has already happened in the Pamirs. During Soviet rule, indigenous knowledge about medicinal plants in the Tajik Pamirs was suppressed because it was associated with religious practices that were outlawed by the central government. Consequently, several generations of children were not taught about medicinal plants.

Presently, knowledge about medicinal plants is being revived and taught to younger generations (see Figure 4). As this process of sharing occurs, it is important to recognize that knowledge is constantly evolving and adapting to changing situations. Children are learning from their grandparents, generating new context specific knowledge. Such knowledge is increasingly valued for survival and good health after the collapse of the command economy. Moreover, young scientists are working with local knowledge holders to conserve and advance knowledge of medicinal plants. These exchanges are infusing new energy and vitality to a long historical tradition of plant use for both food and medicine. This in turn inspires new areas of research and exploration based on respect for one's habitat and an ethic of conservation through use.

**Figure 4: A boy from Ishkashim returns with licorice (*Glycyrrhiza glabra L.*). In the Pamirs, licorice has several uses including treatment of coughs, kidney ailments, and difficulty during childbirth.**





In addition to providing options that strengthen health sovereignty, there is another reason why this knowledge of plants is important: it provides the foundation for a mutually beneficial relationship between people and plants. In the Pamirs, people tend to plants because they are important to them. Knowing how to use plants requires ecological knowledge regarding their conservation. People nurture plants they find beneficial by protecting their habitats, spreading their seeds, transplanting them into nearby gardens, and more. In return, plants are providing health sovereignty to these mountainous peoples. The result of these interactions is the conservation of biodiversity, which in turn sustains communities under conditions of socio-cultural change.

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