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AT THE CROSSROADS BETWEEN EAST AND WEST

IN THREE HOSPITABLE COUNTRIES
AGRICULTURE AND BREEDING HAVE BEEN DEVELOPED SINCE THE NEOLITHIC
COPING WITH THE RHYTHMS OF THE SEASON
A TREASURY OF GENETIC RESOURCES IS MAINTAINED IN GARDENS
TO MAKE BREAD, CHEESE AND WINE
PASTORALISTS AND FARMERS MANAGE THE LANDSCAPES
RURAL PEOPLE KNOW AND USE WILD PLANTS AND ANIMALS

COMBINING BIODIVERSITY, HEALTHY ECOSYSTEMS AND SMALLHOLDERS' DEDICATION:
A PATHWAY INTO THE FUTURE

Արևելքի և Արևմուտքի քառուղիներում

Şərqin və qərbin yolayrıcında

აღმოსავლეთისა და დასავლეთის გზასაყარზე

1 INTRODUCTION

WHEN LOOKING AT A MAP OF EURASIA, IT IS QUITE EASY TO IDENTIFY THE CAUCASUS REGION: IT IS THE LARGE CORRIDOR THAT LIES BETWEEN THE BLACK AND THE CASPIAN SEAS – A SORT OF GEOGRAPHIC HINGE THAT CONNECTS ASIA IN THE EAST TO EUROPE IN THE WEST. THE CAUCASUS IS ALSO LOCATED IN THE MIDDLE OF THE TRANSITION ZONE BETWEEN TEMPERATE AND SUBTROPICAL CLIMATE ZONES, WHICH CREATES FAVOURABLE CONDITIONS FOR THE GENETIC EVOLUTION OF A WIDE RANGE OF FLORA AND FAUNA.

This unique situation has made it possible for the Caucasus to be a bridge between eastern and western flora, a centre of genetic differentiation that has created new endemic varieties and, at the same time, a door that has diffused the precious genetic material from east to west and from north to south and vice versa. This explains why, in some areas of the Caucasus, species of European or Asian origin grow next to endemic species, adapted to continental, Mediterranean and subtropical climates.

In the lowlands along the Caspian seashores, characterized by significant pedoclimatic variability, non-endemic species such as tobacco, potatoes, tea, maize, cotton and citrus fruits are perfectly adapted and thrive together with species that have long been cultivated such as wheat, figs, almonds, pistachios, olives and pomegranates.

The region is also situated along the main routes that have been used for thousands of years to connect the East to the West and Asia to Europe, and this is reflected in the different populations, languages, cultures and religions that characterize it. Nevertheless, this rich biodiversity is now at risk because of overexploitation of natural resources, mass production of just a few species and varieties, and the effects of climate change.

The result is that a region which once provided world agriculture with several major crops is currently experiencing a food deficit. It is important to spread awareness of the value of the rich heritage of genetic resources in the Southern Caucasus and sustain policies for its correct maintenance, both at the local and international level.

The Southern Caucasus is the region of interest discussed in this book. It is a large corridor that lies between the Black and the Caspian Seas – a sort of geographic hinge that connects Asia in the east to Europe in the west. It is dominated by the great mountain ranges that give their name to the region and divide it into the Northern and Southern Caucasus

TERRITORY

The Caucasus is dominated by the great mountain ranges that give their name to the region. Its morphology and climate are extremely diverse. Within a few hundred kilometres, altitudes vary from zero to over 5 000 m and down again to the –30 m of the depression along the western coast of the Caspian Sea. The result of these dramatic changes is that the climate varies from continental in the north, to alpine in the inner mountainous areas, to subtropical in the west and to dry steppe in the southeast. In a fairly limited area, most of the world's major ecoregions can be found. Rainfall ranges from as little as 200 mm per year in the eastern lowlands to more than 2 500 mm per year on the Black Sea shore.

The Greater Caucasus range seen from the neighbourhood of Kish, Azerbaijan. The territory of the Southern Caucasus is highly differentiated, with altitudes ranging from over 5 000 m down to –30 m. >>*Right*: **the multiple colours of the eroded shale formations of the "Candy Cane" mountains, Xizi region, Azerbaijan**

The Caucasus region comprises the following:

- the plains and hills along the northern slopes of the Greater Caucasus range;
- the Greater Caucasus range, which is more than 1 000 km long, and lies between the eastern shores of the Black Sea at about 44° latitude north and the western shores of the Caspian Sea at about 41° latitude north. It is more than 5 000 m high (the highest peak is Mount Elbrus, in the Russian Federation, at 5 642 m; Mount Shkhara, in Georgia, is 5 201 m high);
- the plains and hills along the eastern shores of the Black Sea in Georgia;
- the Lesser Caucasus range, which is approximately 500 km long, and lies between the eastern shores of the Black Sea at about 42° latitude north and the River Araz at approximately 39° latitude north. It is more than 4 000 m high (the highest peak is Mount Aragats, in Armenia, at 4 095 m);
- the hills, plains and lowlands along the shores of the Caspian Sea in Azerbaijan;
- the highlands of the Armenian plateau, located between the southwestern slopes of the Lesser Caucasus range and the River Araz.

The territory to the north of the Greater Caucasus range (the "Northern Caucasus") belongs to the Russian Federation and, more precisely, to the regions of Krasnodar and Stavropol, and to the autonomous republics of Adygea, Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechnya and Dagestan.

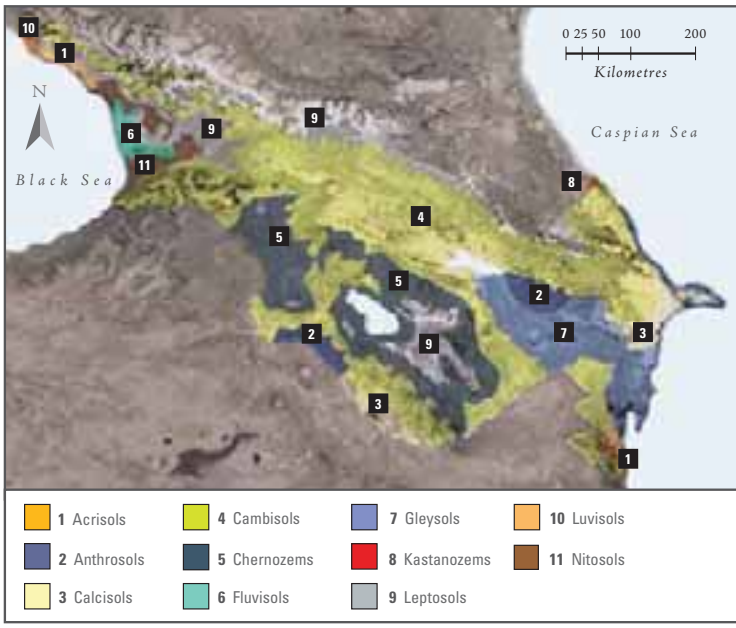
The rest of the Caucasus region (the "Southern Caucasus") is the focus of this book and belongs to Armenia, Azerbaijan and Georgia; at the southern borders of the Caucasus are Turkey to the west and the Islamic Republic of Iran to the east.

SURFACE AREA AND INHABITANTS OF THE CAUCASUS REGION

	Surface (km²)	Inhabitants	Density (inhabitants/km²)
Caucasus region	440 400	30 756 000	70
Northern Caucasus (Russian Federation)	254 300	14 506 000	57
Southern Caucasus (Armenia, Azerbaijan and Georgia)	186 100	16 250 000	87

Source: State Statistical Services of Armenia, Azerbaijan and Georgia (2009), and of the Russian Federation (2004)

MAP OF SOILS



Adapted from Harmonized World Soil Database and derived SRTM DEM (FAO/ CAS / IIASA / ISRIC / JRC)

Lake Sevan, in Armenia, is the largest lake in the Southern Caucasus. *Below:* **the confluence of the Aragvi and Mtkvari rivers in Georgia**
>>Right: **the River Mtkvari then flows into Azerbaijan, where it is called Kür**

The main rivers in the Southern Caucasus are the following:

- River Kür (Mtkvari): 1 364 km long. It springs on the Turkish side of the Armenian plateau near Kars and flows through Georgia and Azerbaijan into the Caspian Sea at Neftçala;
- River Araz: 1 072 km long. It springs near Erzurum (Turkey) and flows along the border between Turkey and Armenia; Nakhchivan (Azerbaijan) and the Islamic Republic of Iran; Armenia and Iran; Azerbaijan and Iran; and finally flows into the River Kura at Sabirabad in Azerbaijan;
- River Rioni: 327 km long. It springs in the Racha region in Georgia and flows into the Black Sea near Poti.

The main lake in the Southern Caucasus is Lake Sevan, in Armenia, with 1 250 km^2 surface area, located at an altitude of about 1 900 m above sea level. It receives water from several rivers flowing from the Lesser Caucasus range; its main emissary is the River Hrazdan that flows through Yerevan and into the River Araz.

The second largest water basin is the artificial lake formed by a dam built in the 1950s on the River Kür in Azerbaijan near Mingacevir. It has a surface area of 605 km^2.

A great number of small lakes dot the region, mainly in Azerbaijan.

The Caspian Sea is the largest lake on Earth, by both area and volume, with a surface area of 371 000 km^2 and a volume of 78 200 km^3. It is a landlocked endorheic body of water and lies between Asia and Europe. It has a maximum depth of about 1 025 m and is called a sea because when the Romans discovered it they tasted the water and found it to be salty. It has a salinity of approximately 1.2 percent, about a third of the salinity of seawater.

Within a few hundred kilometres, many different climatic patterns can be found, contributing to the rich biodiversity of the territory

CLIMATE

The Caucasus region lies in the middle of the temperate zone of the northern hemisphere, but the Greater Caucasus range acts as an important climate separator, since it prevents the movement of cold air masses from north to south and conversely that of warm air masses from south to north. As a consequence, the Northern Caucasus has a continental climate with cold winters and warm summers, while the Southern Caucasus has a generally milder climate, although with significant variations depending on factors such as altitude, influence of water basins and latitude.

From west to east, the following climate zones can be identified in the Southern Caucasus.

- The coastal region along the Black Sea, in Georgia, has a subtropical climate, with a winter mean temperature around 7 °C and a summer one around 21 °C. Humid air drafts from the sea imply significant rainfall, ranging between 1 000 and 2 000 mm per year, with peaks of over 2 500 mm per year.
- Moving eastwards, the influence of the sea decreases and the altitude increases, and the climate becomes cooler and drier. In Tbilisi, the capital city of Georgia, at a height of 490 m above sea level, the winter mean temperature is 2.5 °C and the summer one is 23 °C; rainfall reaches 500 mm per year.
- In the central part of the Southern Caucasus, dominated by the Lesser Caucasus range and the Armenian plateau, the climate is continental, with cold dry winters and hot dry summers. In Yerevan, the capital city of Armenia, at a height of 900 m above sea level, the winter mean temperature is –1.5 °C and the summer one is 24.5 °C; rainfall reaches 280 mm per year.
- In the mountains, at heights above 2 000 m, the climate is typically alpine, with cold winters and cool summers.
- In the western part of the Caucasus, as the altitude falls below 650 m in eastern Georgia and in northern and central Azerbaijan, the climate is again subtropical, but less temperate and drier, because of the more limited thermal influences of the Caspian Sea as compared with those of the Black Sea. The winter mean temperature is 3 °C and the summer one is 24 °C; rainfall ranges between 300 and 800 mm per year.
- The lowlands along the Caspian Sea, in Azerbaijan, have a dry steppe climate, with warm winters, hot summers and low rainfall. In Baku, the capital city of Azerbaijan on the Caspian shore, the winter mean temperature is 4.5 °C and the summer one is 25 °C; rainfall reaches 210 mm per year.
- The southeastern region of Azerbaijan (Lankaran-Astara), at the foothills of the Talish Mountains along the border with the Islamic Republic of Iran, has a subtropical climate; rainfall is about 1 200 mm per year.

More detailed information on the climate of the Southern Caucasus can be found in Chapter 4.

Near Xudat in Azerbaijan, farmers have adapted to the great diversity of morphology, climate and soils by developing a mosaic of crops and livestock systems, by alternating annual and perennial crops, and by avoiding cultivation of fragile environments in order to protect wild biodiversity, soil and water resources

LANDSCAPES

As mentioned previously, the territory of the Southern Caucasus is diverse, in terms of morphology, climate and soils. As a consequence, there is a great variety of landscapes. Rural people have developed skills and technologies to manage and use this diversity of landscapes and species. Even in areas where terrain and climates are harsh, people have developed effective agricultural systems, making the most of their resources. Throughout history, the countries of the Caucasus have been both major producers and exporters of agricultural products.

In order to adapt to their environment for agricultural production, generations of farmers and agronomists have selected plant species suited to local conditions. The region offers an array of agricultural products, including rice, cereals, tobacco, fruit – Mediterranean and subtropical varieties – and tea, maize, cotton and beetroot.

Meat and poultry production is also widely practised, as is silkworm farming and the processing of agricultural products. The landscape has also been altered in order to make farming more productive.

In Georgia, the plateaus have been terraced to grow vines and fruit trees while, in Armenia, irrigation projects exploiting water from Lake Sevan have been developed in order to increase agricultural production on the plains of Yerevan and Gyumri. The same has happened in Azerbaijan, where building of the Mingacevir dam has enabled large tracts of drylands in the centre of the country to be cultivated. However, agriculture intensification and overexploitation of water resources have also caused problems with soil degradation and loss of biodiversity. Only in recent years has an effort been made by local institutions to overcome these problems.

Thousand of years of farming have shaped the landscapes in order to increase agricultural production and maintain biodiversity of cultivated and wild species. <<*Left:* remains of a mediaeval tower in the Samtskhe-Javakheti region, Georgia

A CENTRE OF GENETIC EVOLUTION AND DIFFERENTIATION

The rich biodiversity of the Southern Caucasus originates from a combination of several factors. The process of mountain formation has played an important role in the differentiation of the vegetation into species. The mountain ranges acted as barriers against the spread of species and genera, enabling the creation of closed ecological systems of grasses and legumes where mutant forms could thrive and become established. There were also isolated human communities exerting their own selection pressures for larger seed size; resistance to shattering; and adaptation to drought, humidity, winter and climate extremes.

Low relative humidity and high sunshine hours during the growing season have created a favourable environment for crop growth, with relatively low incidence of diseases and pests. Crop growing periods range from100 to 220 days and on average there are between 1 900 and 2 900 hours of sunshine per year. These conditions enabled an early start in the development of agriculture, testified by the fact that the Caucasus is still today one of the world's richest sources of genetic diversity for cultivated species. N. Vavilov claims that primitive fruit growing originated in these mountain regions and that, even today, western Asia has the strongest potential anywhere in the world for fruit production, since this is the home of vines, pears, myrobalan or wild plums, cherries, pomegranates, walnuts, quinces, almonds and figs. In this region, all the evolutionary phases of fruit growing can be traced, including the development of hybrids such as those between plum and apricot trees, and almond and peach trees, as well as certain pome fruit genotypes suitable as potential rootstock, both for the *Malus* and the *Pyrus* genus.

FLORA

The Caucasus region is characterized by its rich and unique flora with high concentrations of economically important and edible plants, particularly wild crop relatives such as rye, barley and single-grain wild wheat (*Triticum boeoticum*) and Ararat wheat (*T. araraticum*). The level of endemisms is extremely high, and almost 25 percent of all species are endemics.

A range of intermediate horticulture plants is also cultivated in gardens. Domesticated varieties of fruits and berries have been developed from their wild relatives, including apples, pears, walnuts, hazelnuts, medlars, apricots, cherries and pomegranates. Fodder plants also occur, mainly from two families: Fabaceae (400 species, including *Medicago*, *Trifolium*, *Onobrychis*, *Lathyrus* and *Vicia*) and Poaceae (including species and varieties of *Triticum*, *Zea*, *Agropyron*, *Arrhenaterum*, *Dactylis*, *Festuca*, *Lolium*, *Phleum* and *Bromus*). Of 454 species of grasses (Poaceae) in Azerbaijan, 25 are cultivated.

Pulses, native cultivars of runner beans (*Phaseolus*), lentils (*Lens*), garden peas (*Pisum*) and broad beans (*Vicia*) are also found in this region. Forests are home to particular species unique to the Southern Caucasus, including the Araz oak, eastern beech, Caucasian pine and a coniferous tree called *tis*.

The Southern Caucasian eastern plain grove forest with lianas, now relict, and the mixed Kolkheti forest in western Georgia, where chestnut and eastern beech, Kolkheti, Imereti and Georgian oak, Caucasian hornbeam and ash are grown, unique to the Caucasus. *Zelkova* (*Zelkova carpinifolia*), oak and beech forests are spread over the mountains of the region. Eastern fir and Caucasian fir are found in the dark coniferous forests.

Fruit trees are important in terms of quality of the environment, quality of food and quality of life of the people who depend upon them.

Many local fruits and legumes, such as plums *(left)* and sainfoin *(above)* are adapted to resource-efficient family systems

FAUNA

Southern Caucasian fauna includes species with different categories of endemism – from strictly endemic species to species that are quite common all over the world. The basic endemics are the west Caucasian tur (*Capra caucasica*), east Caucasian tur (*Capra cylindricornis*), noble deer (*Cervus elaphus*), Prometheomys mouse (*Prometheomys schaposchnicovi*), Caucasian black grouse (*Lyrurus mlokosiewiczi*) and Caucasian snowcock (*Tetraogallus caucasicus*).

Furthermore, mammals can be found in the plains, such as wild boars, wolves, foxes, badgers, red foxes and hares as well as reptiles (swamp tortoise, Caspian tortoise, Mediterranean tortoise, stripy lizard, testaceous grass snake, gaunt grass snake and adders); various frog species; birds (pheasants, partridges, *turaj*, eagles, different duck and goose species, crying and puffing cuckoos, coots, *soltan* birds, herons, cormorants and curly-feathered pelicans); and numerous insect species. Apart from animals in the medium and high mountainous belts, there are eastern Caucasian mountain goats, Caucasian deer, Caucasian *kopger*, European roe deer, Caucasian brown bears and bird species such as the golden eagle, Caucasian falcon, Caucasian *tetra* and Caucasian snowcock. Wild ancestors of agricultural animals are represented by rock goats and *bezoar* goats, wild boars and Asian moufflon. *Jeyran* gazelles (*Gazella subgutturosa*) are among the rarest and fastest species in the Caucasus; they are only found in the Shirvan Nature Reserve, Bendovan and Korchay regions of Azerbaijan. Endangered species include chamois, lynx and leopard. Some representative martens, wild ducks, grey geese, herons, pheasants, partridges, quails and forest hens are frequently to be found in the gardens, vineyards and yards of householders.

The rich fauna and flora of the southern Caucasus are protected in many special areas – there are three reserves and two national parks in Armenia; 11 reserves and eight national parks in Azerbaijan and 16 nature reserves and two national parks in Georgia. These protected areas need investments, continuous support and awareness creation programmes and need to become an integral part of and a resource for the rural population that depends upon them.

The Caucasus is characterized by a complex, sometimes mosaic, spatial structure of biological communities, representing different biogeographic zones. The optimal way to protect Caucasian biodiversity is to pay particular attention to this factor, since its most important feature is the constant interaction of local, west Asian and eastern European communities

The impressive diversity of species and varieties of the Southern Caucasus contributes to regulating the climate, providing and producing food and medicine, recycling of wastes and improving ecosystem health [*Source*: AZƏRBAYCAN SSR DÖVLƏT TƏBİƏTİ MÜHAFİZƏ KOMİTƏSİ VƏ AZƏRBAYCAN SSR ELMLƏR AKADEMİYASI. 1989. *AZƏRBAYCAN SSR-in QIRMIZI KİTABI – NADİR VƏ NƏSLİ KƏSİLMƏKDƏ OLAN HEYVAN VƏ BİTKİ NÖVLƏRİ*. İŞIQ]

Rapid degradation of natural habitats, intensification and expansion of cultivation and overgrazing, and replacement of local varieties with highly productive ones are the main factors affecting the diversity of many domesticated species and their wild relatives

HUMAN IMPACT AND ENVIRONMENTAL RISKS

The Caucasus region has been inhabited and exploited by human communities for tens of thousands of years. It has been transformed by human activities and today only a few pristine areas and intact ecosystems remain in remote high-altitude areas and inaccessible gorges. While small-scale family farming had a limited negative impact on biodiversity, most plains and foothills have suffered from human impact, resulting in severe habitat loss.

The diversity of many species and their wild relatives has decreased because of rapid degradation of natural habitats, intensification and expansion of cultivation and overgrazing, and replacement of local varieties with highly productive ones.

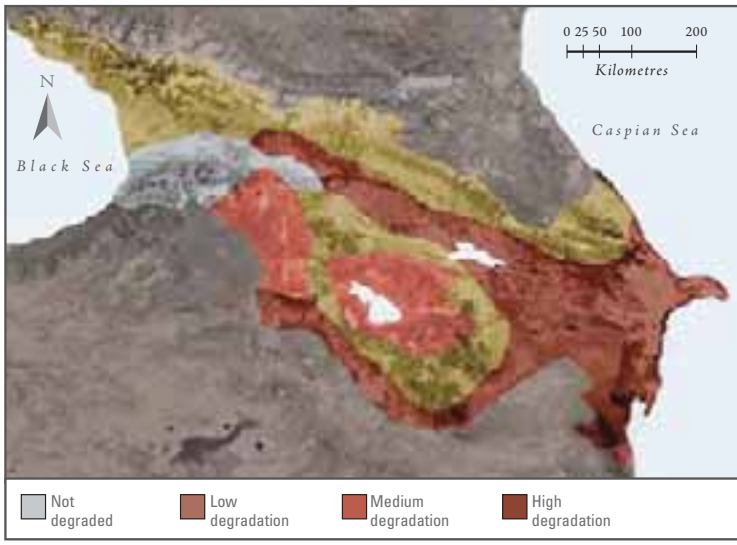
As a result, the local knowledge associated with the use and management of biodiversity is also decreasing.

SOIL EROSION AND DEGRADATION

Soil erosion and degradation are serious problems. In addition to natural processes, significant contributions arise from tillage practices (deep ploughing), cultivating steep slopes, overgrazing and logging. Overgrazing by sheep and cattle has eroded the natural vegetation in more than 30 percent of subalpine and alpine summer ranges and about 50 percent in the winter ranges of the steppe and semi-desert areas. Overgrazing has resulted in reduced species diversity and habitat degradation.

The map, extracted from the "World map of the status of human-induced soil degradation", represents the overall severity by which the physiographic unit is affected by soil degradation. This item takes the degree[1] and extent[2] into account. The original classification is 1 (low) to 4 (very high). Note that none of the three countries has class 4 (very high soil degradation severity).

MAP OF SOIL DEGRADATION SEVERITY



Source: Oldeman, Hakkeling and Sombroek, 1991

[1] Degree: a measure of how strongly the soil is affected by degradation, estimated in relation to changes in agricultural suitability, to declined productivity and to biotic functions of the soil. Four levels of degree are distinguished: light, moderate, strong and extreme.

[2] Extent: the percentage of the area of the map unit that is actually affected by soil degradation. Five classes from infrequent to dominant are considered: 0–5%, 5–10%, 10–25%, 25–50% and 50–100%.

SOIL AND WATER POLLUTION

by Mark Lawrence Davis

During the 1980s, the Southern Caucasus produced very large numbers of agricultural products such as citrus fruits, tea, grapes and cotton, and pesticides were widely used for disease control and crop production. But the management of pesticides was weak, with evidence of oversupply, overuse and poor management resulting in the accumulation of extremely large obsolete pesticide stockpiles, and many varied and widespread adverse impacts on human health and the environment.

The problems caused by pesticide mismanagement persist in the Southern Caucasus where agriculture is the mainstay of the economy and represents about a third of national GDP, and pesticides constitute the majority of chemicals in use. Obsolete pesticides were stored for many years in main and small storage facilities or buried, with consequences for the quality of soils, groundwater and air, which were poorly monitored.

Imprecise data on the composition of the hazardous chemicals that were stored exist, but are insufficiently collected, compiled and aggregated on a regular basis, because of lack of adequate technical, institutional and financial capacity to develop the policy and regulatory conditions necessary to clean up the contaminated wastes/sites and to destroy the stocks of obsolete pesticides or manage those in use properly.

Improved understanding of the health and environmental hazards associated with pesticides has led to the development of sophisticated regulatory and control systems designed to control pesticide trade, management and use. Examples include the Rotterdam and Stockholm Conventions, the International Code of Conduct on the Distribution and Use of Pesticides and the Organisation for Economic Co-operation and Development (OECD) Pesticides Working Group.

In agricultural production areas, mismanagement of waste such as obsolete pesticides has severe effects on soil and water pollution and consequently on human and animal health

FAO established a programme for the prevention and disposal of obsolete pesticides in 1994 and has worked to raise awareness, provide guidance and implement projects to remove obsolete pesticides and build up countries' pesticide management capacity. Efforts have also been made in recent years to improve control over pesticides. Many countries have ratified international agreements, developed regulations, moved away from centralized purchasing systems, imposed controls for illegal dumping of hazardous wastes, imposed tighter border controls, and developed integrated pest management (IPM) programmes to reduce reliance on pesticides. However, given the pressures of increasing agricultural exports and a more stringent market, the relevant authorities in the Southern Caucasus are currently willing to act on both obsolete pesticides and pesticide management issues. A FAO project is currently supporting capacity development for sound management of obsolete pesticide stockpiles and strengthened management of agricultural pesticides in the three Southern Caucasus countries. In addition, efforts are in place to develop projects and secure financing to quantify and eliminate obsolete pesticide stocks and remediate sites that have been severely contaminated through the burial or dumping of pesticides over many years. Actions have already been taken to sample and analyse contaminants in Armenia, put in place pesticide stock management software in Georgia and formulate proposals for obsolete pesticide inventory, risk assessment and risk reduction actions in Azerbaijan.

The impact of this project will be to contribute to preserving the environment and the health of the population from adverse pesticide effects, promoting sustainable agriculture and facilitating access to healthier food.

Overgrazing by sheep and cattle has contributed to the erosion of the natural vegetation in more than 30 percent of subalpine and alpine summer ranges and in about 50 percent of the winter ranges in the steppe and semi-desert areas

OVERFISHING AND POACHING

Overfishing has serious implications for the food security and economic development of the region, since it reduces welfare and has a dramatic impact on the entire marine and freshwater system. The lack of proper marine and inland fisheries management means that fish stocks of the most popular and valuable species, notably sturgeon (Acipenseidae – including *Huso huso, Acipenser nudiventris, A. persicus* and *A. stellatus*) and salmon (Salmonidae – *Salmo trutta caspius*) in the Caspian Sea, have diminished and continue to do so. Similarly, in the Black Sea, overfishing of the commercial stocks of anchovy (*Engraulis encrasicolus)* by fishing vessels under foreign flags is seriously threatening the survival of the stocks in Georgian waters.

Apart from overfishing, the most serious threat for aquatic biodiversity and fish biomass in the Black and Caspian Seas is the invertebrate predator-ctenophore (*Mnemiopsis leidyi*). Ctenophores attack the eggs and larvae of many fish species in the Black Sea and, since the end of the 1990s, also in the Caspian Sea. Oil pollution and other anthropogenic influences have further added to the decline in biodiversity and fish biomass in the coastal areas of the Black and Caspian Seas.

Poaching of wild animals has increased significantly since the 1990s. The animals at the highest risk in Georgia are leopards (*Panthera pardus*), brown bears (*Ursus arctos*), wolves (*Canis lupus*), *bezoar* goats (*Capra aegagrus*) and turs (*Capra caucasica*), chamois *(Rupicapra rupicapra)* and lynx *(Lynx lynx)*.

Because of extensive hunting in the Southern Caucasus, the populations of Caucasian deer *(Cervus elaphus)* are decreasing. Hunting, extensive sheep farming and habitat occupation may have caused the drastic decline of hyena *(Hyaena hyaena)*. Persian gazelle *(Gazella subgutturosa)* almost disappeared in the early 1960s; some reasons were excessive hunting and the degradation of habitats through human impact. This gazelle has recently been reintroduced in national reserves of Azerbaijan.

In the recent past, unbalanced exploitation of natural resources has caused the loss of wild and domesticated species. Today, there is increasing awareness that biodiversity is fundamental for food security and economic development

LOSS OF PLANT BIODIVERSITY

The Caucasus is a region of unique diversity, but today this characteristic is jeopardized by inappropriate agricultural practices, loss of natural habitats and heavy industrialization processes. Genetic erosion caused by the introduction of new varieties resulted from the development of modern breeding, but it is necessary to note that a great many imported varieties, which were not suited to local nature-climatic conditions, became unfit for cultivation and diseases spread.

Around the 1960s, governmental strategy in general was to decrease wheat production in the Southern Caucasus. The main emphasis was on maize, subtropical fruit (mandarins, lemons, oranges), wine and tea production, often resulting in local erosion of biodiversity.

The number of rare and vanishing plants in Armenia is tangible. It is thought that approximately 30 species of vascular plants have vanished during the last hundred years, and no fewer than 200 species are deemed rare and exposed to the danger of extinction. More than 20 local varieties of wheat were cultivated in Armenia before 1950.

Currently, only two or three varieties have been preserved; the others are no longer adopted because of their low productivity, despite their important characteristics of drought resistance (*Galgalos, Spitacahat, Karmrahat, Zarda*), fungal resistance (*Deghnazarda, Tavtukhi, Grnani*) and cold tolerance (*Karmir slfahat*). Many of the varieties approaching extinction are not preserved in seed collections.

In Azerbaijan, some plants of both small and market importance are in danger of decline, such as *Capsella bursa-pastoris* L., *Echinochloa oryzoides* Fr., *Heracleum trachyloma* L., *Capparis herbaceae* L., *Sorghum vulgare*, *Milium effusum* and *Rumex* species.

During the last three to four years, the number of species and varieties of some crops (apricots, pears, grapes and leaf vegetables) taken to markets by farmers has increased, while others have decreased in number (watermelons, grain cereals and grain legumes). The local crops available for market vary from region to region. In Baku markets, only four varieties of quince can be found, while in Nakhchivan markets there are 12 varieties. Yet 12 grape varieties are sold in Baku and 15 in markets nationwide. At one time, tens of barley varieties were grown by farmers but now only three to four varieties can be found.

There are ten species of vascular plants known to be extinct in Georgia. Approximately 50 species are known to be in danger of rapid extinction. Until the 1960s, 14 species of wheat and 144 varieties were registered in the region. This was 62 percent of species of wheat registered in the world. At present, this number, especially of varieties, has decreased dramatically.

Millet (*Panicum miliaceum*) and foxtail (*Setaria italica* P. Beauv. – *ghomi* in Georgian) have been grown in Georgia for countless years. Millet was used as a supplementary feed (for animals and poultry) and for making alcoholic drinks. Foxtail grew only in west Georgia and was used for human food. The dish made from foxtail was also called *ghomi*. This dish is still very popular in west Georgia as an everyday meal but is now made with maize, which has almost completely supplanted millet and foxtail. A foxtail-sown area can currently be found in the Samegrelo region of west Georgia.

Rice has also been grown in southern Caucasian countries from ancient times. The seventeenth century Italian missionary A. Lamberti wrote about the Samegrelo region:

"In the main part of Odishi (the same as Samegrelo), where water was bogged and there was no possibility of growing ghomi, farmers grew rice, which was harvested so much that it was exported to Turkey by Turkish boats."

However, from 1932 it was decided to replace rice with cotton in Azerbaijan and with tea in Georgia.

Georgia used to produce excellent flax but today only a small sown area remains in the south. The eighteenth century Georgian scientist and geographer Vakhushti Bagrationi in *Kartli's life* notes the cultivation of volatile oil-bearing plants (roses, camphor, lavender and basil).

The industry for processing the raw materials of these plants developed intensively in the seaside regions of Georgia until the end of the nineteenth century. From cultivated plantations of roses and basil, Georgians produced annually an average of 72–75 tonnes of volatile oil-bearing plants during the Soviet period. This industry no longer exists. In west Georgia there are only a few farmers cultivating roses on a small scale and making volatile oil from the flowers according to a traditional method.

One of the most economically important Georgian crops is grape (*Vitis vinifera*). It has a wild relative species, *V. sylvestris*, which grows naturally in the riparian forests of both west and east Georgia. However, the area of riparian forests is declining and the wild grapevine is under threat and requires protection. Introduction of a parasite from abroad is another reason for the reduction in the native population.

Diversity of landraces/farmer varieties has been declining for more than 50 to 70 years, since the establishment of large specialized farms. This trend continues and the share of varieties in field crops is negligible. Numerous Georgian wheat landraces remain only in collections. Nevertheless, farmers' varieties in fruit crops should be sizeable since local varieties of apples, pears, plums and grapes can be found in their gardens.

Genetic erosion of domesticated breeds can be prevented by increasing support to local farmers and pastoralists through programmes of *in-situ* maintenance of breeds

LOSS OF ANIMAL GENETIC RESOURCES

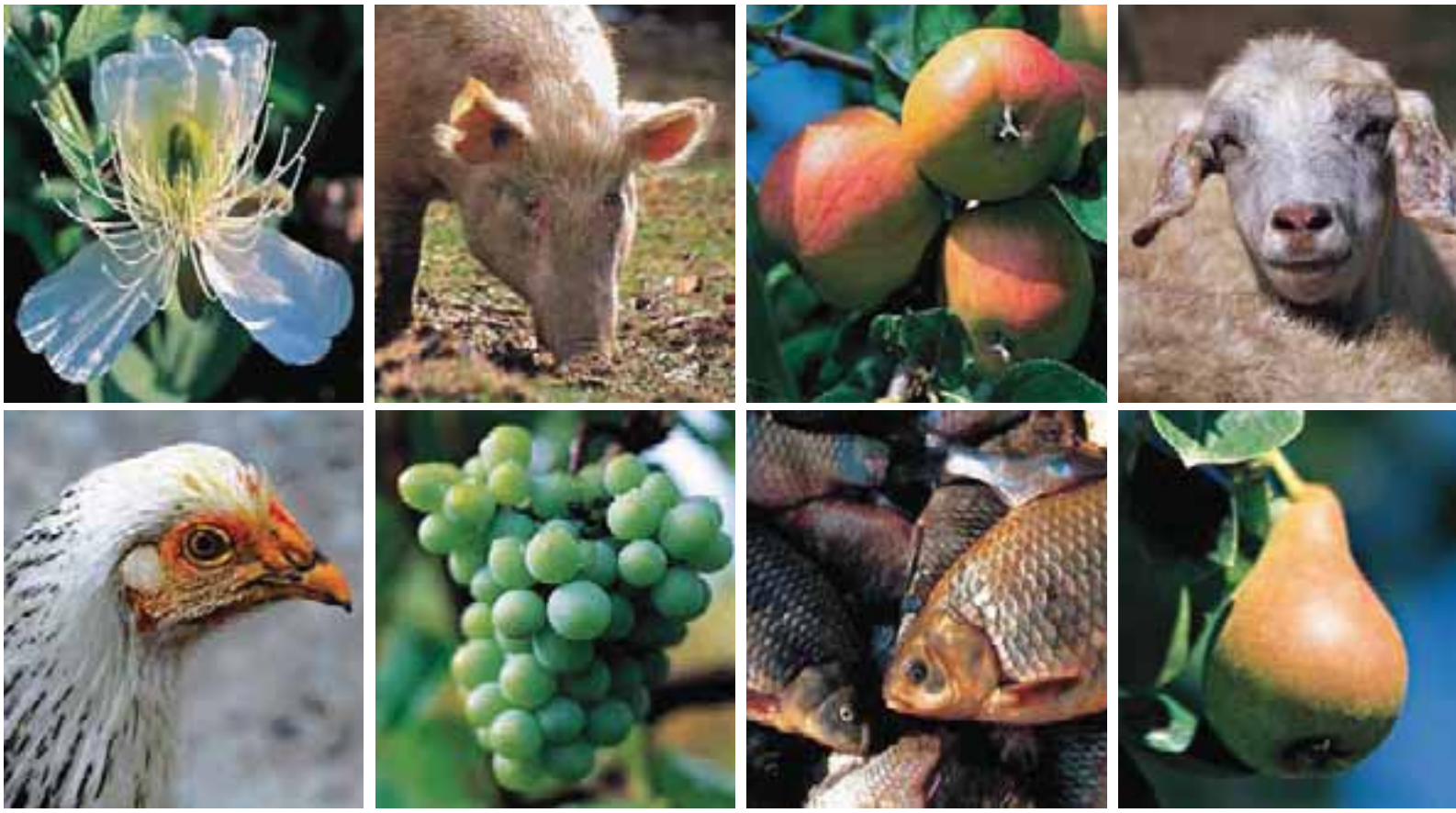
Similar problems have also been encountered with animal biodiversity. In many parts of the Southern Caucasus, local livestock breeds are being crossed or replaced with exotic higher-yielding animals, with more input requirements, in order to increase production. In parallel, many native habitats where local livestock were raised with low input strategies are steadily disappearing, as they relinquish their domain to agriculture, protected nature reserves and industrial activities. This trend is further encouraged by formal policies, short-term profit opportunities, production subsidies, and a decreasing appreciation of the value and multiple functions of local breeds by consumers and international markets.

Livestock keepers have for centuries selected farm animal species and breeds to adapt to the production potential of their environments and to respond to their needs for meat, dairy products, eggs, fibre, fertilizers, manure and draught power. Chapter 7 gives some examples of these local breeds that are still maintained today, thanks to the work of dedicated farmers and pastoralists, who are aware that local breeds adapt efficiently to their habitats, feeding resources, farming practices and limited availability of inputs. But many of these breeds are disappearing because of changing production systems (e.g. animal draught power and transport are replaced by machinery), processing methods (cheese and yoghurt processing factories require animals with very high productivity) and distribution chains.

Consumers today would benefit from maintaining this animal biodiversity since it offers a wide choice of products for a varied and nutritious diet, produced with reduced negative externalities. Livestock diversity also represents future capacity to use local feeding resources better; the animals have a higher resilience to local diseases, reproduce better in the climatic conditions of the Southern Caucasus, make a more efficient use of reduced farm inputs, and minimize the environmental footprint of agricultural activities.

CONSERVATION OF GENETIC RESOURCES AND FAO

The erosion of agricultural biodiversity, mainly caused by the abuse of the Earth's natural resources, is producing a rapid and deep-seated degradation of the environment and generally impoverished conditions of life in the biosphere, especially for poor rural people who depend on the support of biodiversity in their daily lives. There is a need to reverse this erosion trend because the conservation of genetic resources is essential if we are to ensure that any processes unleashed into the environment remain as manageable, reversible and climate resilient as possible. The diversity of life on the planet contributes to human well-being, to combat poverty and malnutrition, and to global economic development. An enduring solution to maintain agricultural biodiversity will require a fresh perception of our relationship with the different ecosystems, accepting and recognizing the planet's limitations, and the vulnerability of its natural balance.



FAO is committed to promoting the conservation and sustainable use of biodiversity for food and agriculture as a means of helping people to ensure sustainable livelihoods and climate resilience based on their own resources.

FAO assistance is channelled through various avenues including, for example, programmes and activities such as participatory training for IPM programmes (e.g. through Farmer Field Schools), and advice on soil and water conservation practices. At the policy level, FAO provides intergovernmental fora where biodiversity-related policies are discussed and relevant agreements negotiated and adopted by member countries.

THE COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

by Álvaro Toledo Chavarri

The Commission is a permanent forum where governments discuss matters relevant to genetic resources for food and agriculture, including those important for crop, livestock, forestry and aquaculture production.

The Commission works towards raising the awareness of the erosion of genetic resources and looks to the future for ways to solve problems and contribute to the achievement of the Millennium Development Goals through the management of biodiversity. Its 172 member countries negotiate and oversee the implementation of global policies for the conservation and sustainable utilization of genetic resources as well as the fair and equitable sharing of benefits deriving from their use, for present and future generations.

The Commission's Multi-Year Programme of Work foresees the preparation of country-driven global assessments for various components of biodiversity for food and agriculture, and covers a whole range of cross-sectoral matters.

The Commission provides a permanent forum for governments to discuss and negotiate matters relevant to biological diversity for food and agriculture. The Commission aims at reaching international consensus on policies for the sustainable use and conservation of genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use in support of global food security and sustainable development, for present and future generations

In 2010, FAO launched the Second Report of *The State of the World's Plant Genetic Resources for Food and Agriculture*, and in 2007 published *The State of the World's Animal Genetic Resources for Food and Agriculture*. The programme also foresees global assessments of the state of the world's forest and aquatic genetic resources. A key long-term goal of the Commission's Multi-Year Programme of Work is the first-ever State of the World's Biodiversity for Food and Agriculture foreseen for 2017. In addition, the Commission negotiates and oversees implementation of global policies. A major achievement has been the negotiation of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The Global Plan of Action for Animal Genetic Resources, adopted in 2007, is an internationally agreed framework for the management of biodiversity in the livestock sector. In 2009, FAO published *Guidelines for the Development of National Strategies and Action Plans for Animal Genetic Resources* as part of a series of guideline publications addressing specific technical subjects.

HERITAGE OF GENETIC RESOURCES

The well-being of the Southern Caucasus people is also based on the wealth of wild and domesticated genetic resources that can sustain agriculture and food production despite the harsh climatic conditions. Plant genetic resources for food and agriculture are the raw material that farmers and breeders need to improve the quality and quantity as well as the resilience and adaptation of their crops.

The farmers of the Southern Caucasus have made and will continue to make an important contribution towards the conservation and development of plant genetic resources, and particularly those for which the region is a centre of origin and crop diversity and constitute the basis of food and agriculture production throughout the world.

Farmers' knowledge is essential to identify, collect, farm and disseminate agricultural species and to continue the process of adaptation between humans, the plants they grow and their environment.

While we depend on cultivated plants to satisfy the basic human need for food, crops depend on humanity for their continued existence: much of their genetic diversity can only survive through continued human use and conservation.

The entire society will benefit from recognizing and valorizing the role of farmers in the maintenance of their genetic heritage. By facilitating the continuous exchange of plant genetic resources for the continuous improvement of food crops, consumers will have access to a greater variety of foods and agricultural products, thereby helping to underwrite their food security. At the same time, the scientific community will benefit through an improved and better regulated access to plant genetic resources that are crucial for research and plant breeding. International agricultural research centres will have new research opportunities because the International Treaty on Plant Genetic Resources for Food and Agriculture (the "Treaty") places their collections on a long-term secure legal footing. As a result, both the public and the private sectors will have assured access to a wide range of genetic diversity for improved agricultural development.

THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

by Shakeel Bhatti

The FAO Conference adopted the International Treaty on Plant Genetic Resources for Food and Agriculture in November 2001, and it entered into force in 2004, after 40 governments had ratified it. As at 28 February 2010, it has 123 Contracting Parties. This legally-binding Treaty covers all plant genetic resources relevant for food and agriculture.

The Treaty's objectives are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use. It is in harmony with the Convention on Biological Diversity (CBD).

No country is self-sufficient in plant genetic resources, and international cooperation and exchange of genetic resources are therefore of pivotal importance and necessary for food security.

Through the Treaty, countries have agreed to establish a multilateral system to facilitate access to key plant genetic resources for food and agriculture, and to share the benefits derived from that access in a fair and equitable way. The Treaty therefore provides the international policy framework as well as practical mechanisms to achieve these goals, including for the adaptation of food crops in response to the challenges of climate change. The Treaty also recognizes the enormous contribution that farmers and their communities have made and continue to make to the conservation and development of plant genetic resources.

This is the basis for farmers' rights, which include the protection of traditional knowledge, and the right to participate equitably in benefit-sharing and in national decision-making about plant genetic resources. It gives governments the responsibility for protecting and implementing these rights.

The Treaty aims at recognizing the enormous contribution of farmers to the diversity of crops that feed the world; establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials; and ensuring that recipients share benefits they derive from the use of these genetic materials with the countries from which they originated

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FROM INDIFFERENCE TO AWARENESS: AN ENGAGEMENT TO MAINTAIN AGROBIODIVERSITY FOR FOOD SECURITY

THE SOUTHERN CAUCASUS, AT THE CROSSROADS BETWEEN EAST AND WEST, NORTH AND SOUTH, GUARDS AN IMPRESSIVE AMOUNT OF SEEDS AND GENETIC RESOURCES THAT ARE THE FOUNDATIONS OF MODERN AGRICULTURE, WHICH HAS TO RESPOND TO INCREASING ENVIRONMENTAL, CLIMATIC AND FOOD SECURITY CHALLENGES.

Many of these seeds could be cultivated in the future by farmers in different parts of the world who will have to adapt rapidly to drought, flood, cold and pest stresses by adopting more resource-efficient and environmentally friendly farming systems.

If new forms of sustainable agriculture are to be developed, centred on an increased environmental awareness and the need to develop low-energy agriculture for healthy and year-round food security, the global community will have to support maintenance of these genetic resources.

Innovative and fair policies and agreements will have to be defined and important investments in the agriculture sector will need to be committed at the national, regional and global levels.

The time has come to engage.