

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

Էկոհամակարգային մոտեցումը կարող է հիմնարար դեր խաղալ

Biomüxtəlifliyn, sađlam ekosistemlərin və xırda fermer öhdəliklərinin məcmusu:
gələcəyə aparan yol

Ցիոմրազալֆերոջնեբիս, սալի Եկոսիստեմեբիսա ևա մցիրե ֆերմերտա
մալիսեմեջիս Երտոբլիոբա: ց՞ա մոմազլիսկեյն

THE ECOSYSTEM APPROACH, COMPOSED OF 12 PRINCIPLES, IS THE PRIMARY FRAMEWORK FOR ACTION UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY. COP 9 DECISION IX/7 (BONN, MAY 2008) NOTES THAT THE ECOSYSTEM APPROACH IS A NORMATIVE FRAMEWORK FOR BRINGING TOGETHER SOCIAL, ECONOMIC, CULTURAL AND ENVIRONMENTAL VALUES. THUS, THE APPLICATION OF THE ECOSYSTEM APPROACH WILL HELP TO REACH A BALANCE OF THE THREE OBJECTIVES OF THE CONVENTION: **CONSERVATION, SUSTAINABLE USE AND THE FAIR AND EQUITABLE SHARING OF THE BENEFITS ARISING FROM THE UTILIZATION OF GENETIC RESOURCES.**

THIS FINAL PART OF THE BOOK PROVIDES SOME EXAMPLES OF HOW FARMERS APPLY ALL 12 ECOSYSTEM PRINCIPLES TO OBTAIN SUFFICIENT FOOD FROM THEIR LAND, MAINTAIN THEIR NATURAL RESOURCES FOR THEIR CHILDREN AND DEVELOP THEIR SOCIETIES, CULTURAL VALUES AND LIFESTYLES.



PRINCIPLE 1

THE OBJECTIVES OF MANAGEMENT OF LAND, WATER AND LIVING RESOURCES ARE A MATTER OF SOCIETAL CHOICES

Rural people use wild and cultivated genetic resources in the Southern Caucasus for their food security, according to their own economic, cultural and societal needs. For example, in Armenia, family farmers grow apples that have a thick skin, which makes them good for handling and for transportation. They also maintain local varieties that can be kept for a year and even longer at room temperature in cool cellars so they are sure that they have sufficient fresh fruit throughout their long winters (Chapter 4). In Azerbaijan, wild pomegranate varieties are used to produce citric acid (Chapter 5). In Georgia, zanduri wheat is grown because it is particularly adapted for making bread much appreciated in the country (Chapter 6).

RECOMMENDATION

The first engagement of the international community towards rural people should be to understand and respect their objectives, rights and needs in a clear way. The type of assistance that the international community should provide is to promote *in situ* and on-farm conservation and use of the many cereals, fruits, legumes and feed landraces and wild relatives in the Southern Caucasus, by empowering local communities and committed scientists.

PRINCIPLE 2

MANAGEMENT SHOULD BE DECENTRALIZED TO THE LOWEST APPROPRIATE LEVEL

People have selected their plants and animals to adapt to and optimize production in their ecosystems. For example, pastoralists have bred buffaloes to make the best use of marshes and poor grasslands (Chapter 7). Farmers have grown alfalfa in rotation with their cereals to increase soil fertility and to have quality forage for their animals in order to produce milk and meat throughout the year (Chapter 4). Local policy-makers define, in agreement with the population, who should use the summer and winter pastures (Chapter 7) in a specific territory and in what manner. These management practices have been developed by farmers who have a good knowledge of the potentials and limitations of the ecosystem that they are farming, and its productive capacity. Working with farmers and providing appropriate scientific information and support would enable them to make efficient, effective and equitable decisions.

RECOMMENDATION

Since people's innate knowledge is the primary richness of the Southern Caucasus, development and implementation of national agricultural and environmental policies should be decentralized, building on and recognizing farmers' knowledge and practices that have been proven to be effective in regulating food production, maintaining both livelihoods and the natural resource base.



PRINCIPLE 3

ECOSYSTEM MANAGERS SHOULD CONSIDER THE EFFECTS (ACTUAL OR POTENTIAL) OF THEIR ACTIVITIES ON ADJACENT AND OTHER ECOSYSTEMS

Increasing the agricultural irrigated area using water from Lake Sevan caused severe consequences on the environment, on natural vegetation, fish, wildlife and water quality. These management interventions have now been reduced but, if they were to continue, the reduction in the level of the lake could cause unpredictable effects of desertification and climate change in the lake area and on other ecosystems (Chapter 7).

RECOMMENDATION

Intensification of agricultural production, particularly through the use of monocultures and through an increase of water use harvested in adjacent ecosystems, should be carefully evaluated. The quality and fertility of soils subject to irrigation should be assessed, and the effect on loss of productive potential in the ecosystems from which the waters are removed should be carefully analysed and predicted.

PRINCIPLE 4

RECOGNIZING POTENTIAL GAINS FROM MANAGEMENT, THERE IS USUALLY A NEED TO UNDERSTAND AND MANAGE THE ECOSYSTEM IN AN ECONOMIC CONTEXT

Traditional systems should be improved with energy-efficient technologies rather than being replaced by large industrial processes based on high-energy consumption and high external inputs. For example, improving safety and market access of local cheese, fruit, vegetables and herbal teas prepared by traditional methods with recipes conserved in almost every family of the Southern Caucasus, will directly benefit the maintenance of local biodiversity, the sustainable use of local resources, balanced diets and also contribute to increased farmers' income (Chapters 4, 7). Incentives and payments of benefits could be given to those farmers who grow local varieties in an energy-efficient system, such as the many fruit varieties resistant to local pests and diseases mentioned throughout the book, and local legumes that contribute to nitrogen fixation as well as the use of compost and manure in the gardens (Chapters 3, 5).

RECOMMENDATION

Traditional food production and processing practices can be the starting-point for diversifying sources of income. Safety technologies should not be replaced but could build on traditional practices, and incentives could be provided to give value to local products. The non-monetary value for the environment of sustainable agricultural practices could be quantified, and this value reflected in the market value of agricultural products.



PRINCIPLE 5

CONSERVATION OF ECOSYSTEM STRUCTURE AND FUNCTIONING, IN ORDER TO MAINTAIN ECOSYSTEM SERVICES, SHOULD BE A PRIORITY TARGET OF THE ECOSYSTEM APPROACH

Throughout this book there are examples of fruits that have been selected and maintained in the Southern Caucasus thanks to people's knowledge of ecosystem structure and functioning. For example, how the effects of seasons on the ecosystem are managed by farmers (Chapter 4), how farmers collect wild plants for medicinal use and to complete their diets (Chapter 8), and how pastoralists move their herds between summer and winter pastures because they know that winter pastures must rest during the long dry summers, while summer pastures provide good-quality forage only from June to September (Chapter 7).

RECOMMENDATION

Agricultural science must be developed to better understand the dynamics within species and among species and their abiotic environment, and the biological processes underpinning ecosystem functions. A better knowledge of physical and chemical limitations to food production is necessary to conserve the productive capacity of the ecosystem. The practical and daily work of farmers who observe and use these interactions to produce food should be scientifically analysed and supported through appropriate policies, promoting their role as guardians of biodiversity and ecosystem structure and functioning.

PRINCIPLE 6

ECOSYSTEMS MUST BE MANAGED WITHIN THE LIMITS OF THEIR FUNCTIONING

*The Southern Caucasus is characterized by dramatic rainfall and temperature changes over a relatively small area, which can limit its natural productivity. However, these are perfect conditions for the genetic evolution of a wide range of plants, and therefore the Southern Caucasus is astonishingly rich in cereals, grain legumes, fodder and fruit plants that can produce and adapt to extreme rainfall and temperature conditions. For example, 26 wild species of pear can still be found today, and popular selection has developed many pear cultivars to fit into the limits of different ecosystems, such as summer- and winter-ripening pear varieties, varieties with different shapes and flavour to suit the different processing needs of the local population, and species adapted to grow in very stony and arid lands, and/or resistant to local pests (Chapters 3, 5). There are cherries resistant to late frosts, geese adapted to feed on local pastures, and wheat such as *dolis puri* resistant to fungal attacks (Chapters 4, 5, 6). Food security and long-term sustainability have been the selection criteria of farmers who have managed the environmental limits of their ecosystems.*

RECOMMENDATION

High energy costs, a decrease in soil fertility, new challenges posed by climate change and food price volatility are putting increasing pressure on ecosystems. Agricultural production must develop efficient technologies and localized management practices with particular focus on small farmers' needs, using more of the solar energy that is so abundant in the region. This can only be possible through the use of locally adapted species and varieties that must be maintained *in situ* and *ex situ* for the future of agriculture. Therefore, new vigour, enabling policies, committed researchers and empowered farmers must work together across sectors, across cultures and across countries to protect the precious genetic material that is preserved in the Southern Caucasus.



PRINCIPLE 7

THE ECOSYSTEM APPROACH SHOULD BE UNDERTAKEN AT THE APPROPRIATE SPATIAL AND TEMPORAL SCALES

In their gardens, farmers use and manage gene diversity by planting different fruit and vegetable varieties adapted to the site-specific conditions of their farms. They also manage species diversity by cultivating fruits and vegetables for sufficient food throughout the year, and breeding animals to complete their diets and collect manure (Chapter 5). They manage their ecosystems by supplementing their diets with wild berries and vegetables, fishing, exploiting the forest and by grazing their livestock over large grassland areas (Chapter 7).

RECOMMENDATION

These traditional management choices made by farmers at gene, species and ecosystem level are based upon their knowledge of biological diversity. Much of this knowledge has resisted the many years of policy and research oblivion. In order not to lose the enormous amount of gene and species varieties maintained in gardens and by landscape memory, rapid actions of characterization, documentation, cataloguing, collection and maintenance of genes and species should be organized and human resources, skills and the capacity of plant genetic resources programmes upgraded.

PRINCIPLE 8

RECOGNIZING THE VARYING TEMPORAL SCALES AND LAG EFFECTS THAT CHARACTERIZE ECOSYSTEM PROCESSES, OBJECTIVES FOR ECOSYSTEM MANAGEMENT SHOULD BE SET FOR THE LONG TERM

Traditional livestock production is based on animals selected for their resistance to cold winters and hot dry summers, and for feeding on poor local forage species. The grazing surfaces are collectively used by pastoralists for wool, meat and cheese production, but also for collection of wild vegetables and medicinal plants, fruits and fuelwood (Chapters 7, 8). Pastoralists know that a balance must be maintained between livestock production and preservation of pasture conditions and that obtaining short-term high gains from intensive livestock production causes land degradation, loss of the most nutritious species and loss of soil fertility. The introduction of so-called “improved” animal breeds to increase short-term production, and disruption of traditional management practices have further exacerbated the pressure on grazing resources, many of which are now degraded and unable to sustain the previous levels of animal production.

RECOMMENDATION

The pressure to obtain increasing short-term gains has often replaced pastoral practices that maintained a balance between the herd and the varying temporal scales and lag effects of grazing on pastures. Therefore, farmers and pastoralists currently need specific education and training programmes that revitalize their understanding of the mechanisms underlying soil fertility, plant growth, biological pest control and ecosystem management as well as other ecosystem services such as pollination and nutrient cycling.



PRINCIPLE 9

MANAGEMENT MUST RECOGNIZE THAT CHANGE IS INEVITABLE

*The traditional practices and genetic resources described in this book have been selected because they all have potential to respond to the new challenges of the twenty-first century. Plant selection and management began during the Neolithic (Chapter 3). People from the region learned how to cope with temperature and rainfall changes and consequently adapted their agricultural management practices (Chapter 4). Today, farmers still maintain smooth-skinned peach varieties in their gardens because they can tolerate drought conditions better than villous ones; these varieties could become important in adapting to changing climatic conditions (Chapter 5). In addition, peach tree seedlings are grafted on good-quality soils, while on damp and heavy soils they respond better to grafting on to the myrobalan; and on dry and calcareous soils on to the almond (Chapter 5). Therefore, if peach production has to be moved to different soil types, farmers know how to graft the tree. Since climatic and human needs constantly change, the genetic resources of wheat are maintained to adapt to such needs (Chapter 6). A variety called dika (*Triticum ibericum*) matures at low temperatures and thrives even in damp conditions, and is therefore maintained to grow in wet mountain locations and to be harvested, if necessary, at an earlier stage while still damp.*

RECOMMENDATION

Adaptability, flexibility and resilience are the key words for coping with long-term occurrences such as climate change. But this is not enough. In order to utilize adaptive management to anticipate and cater for such changes and events it is necessary to move much closer to farmers. Scientific information and climatic data must exit from academic realms and zoom in on the territory and, more important, on the needs of farming communities to provide rapid and targeted information and services, enabling farmers to take appropriate management decisions.

PRINCIPLE 10

THE ECOSYSTEM APPROACH SHOULD SEEK THE APPROPRIATE BALANCE BETWEEN, AND INTEGRATION OF, CONSERVATION AND USE OF BIOLOGICAL DIVERSITY

Rural people understand and use wild plants and animals to complement their diets and the borders between harvesting from the wild and agricultural production are slight (Chapter 8). People harvest wild carrots, asparagus, thyme, berries and melons in many mountain environments, and integrate agriculture in their gardens with pastoralism. They use the natural vegetation as food, medicine and a feed resource but, at the same time, they protect fragile soils from overgrazing and preserve local genetic resources. Traditional fishing schemes pose no immediate threat to fish stocks, but the increased pressure to harvest more fish, and the replacement of native fish with “more productive” species, should be balanced by a profound understanding of the ecosystem and all its varied and conflicting uses.

RECOMMENDATION

A further challenge is to empower the people who use and manage common natural resources (e.g. communal pastures, water resources and forests) in their daily practices of sustainable use and conservation of biodiversity and landscape memory. Political, technical and economic measures must be developed at the national level to sustain food production practices, using a continuum concept that goes from strict protection to sustainable production intensification. Implementing international initiatives at the national level is necessary for enhancing production and protection of the many wild species and varieties of the Southern Caucasus that represent a treasure of genetic resources for the entire world. But it is important that rural people, fishers and pastoralists are given a fair and equitable share of the benefits derived from ownership of traditional practices arising from the maintenance and utilization of genetic resources.



PRINCIPLE 11

THE ECOSYSTEM APPROACH SHOULD CONSIDER ALL FORMS OF RELEVANT INFORMATION, INCLUDING SCIENTIFIC AND INDIGENOUS AND LOCAL KNOWLEDGE, INNOVATIONS AND PRACTICES

One of the most significant achievements of zootechnical science in the twentieth century could be considered the establishment of the Caucasian nut brown breed on the basis of joint work by Caucasian scientists. This breed was raised by crossing Armenian, Azerbaijan, Georgian and Dagestan local cattle mainly with a Swiss breed. In 1863, and during the existence of social farms in improved conditions of feed and care, milk yield reached 3 500–4 500 kg. But today these productive indicators do not correspond to breed standards because breeding farms are mostly disrupted, zootechnical registration is poorly maintained, artificial insemination is poorly practised and therefore the Caucasian nut brown breed, without continuous efforts in innovations and practices, is insufficiently adapted to hot, dry and windy summers and cold, snowy and windy winters (Chapter 7).

RECOMMENDATION

Bridges should be built between traditional practices and innovative production systems and green technologies that meet the demands of today's society from an economic, social and ecological perspective. In the Southern Caucasus, the effectiveness of the ecosystem approach for agricultural production will greatly depend on the capacity to use both the existing scientific and traditional information, appropriate technologies and science tailored to smallholders' site-specific conditions to improve their daily practices.

PRINCIPLE 12

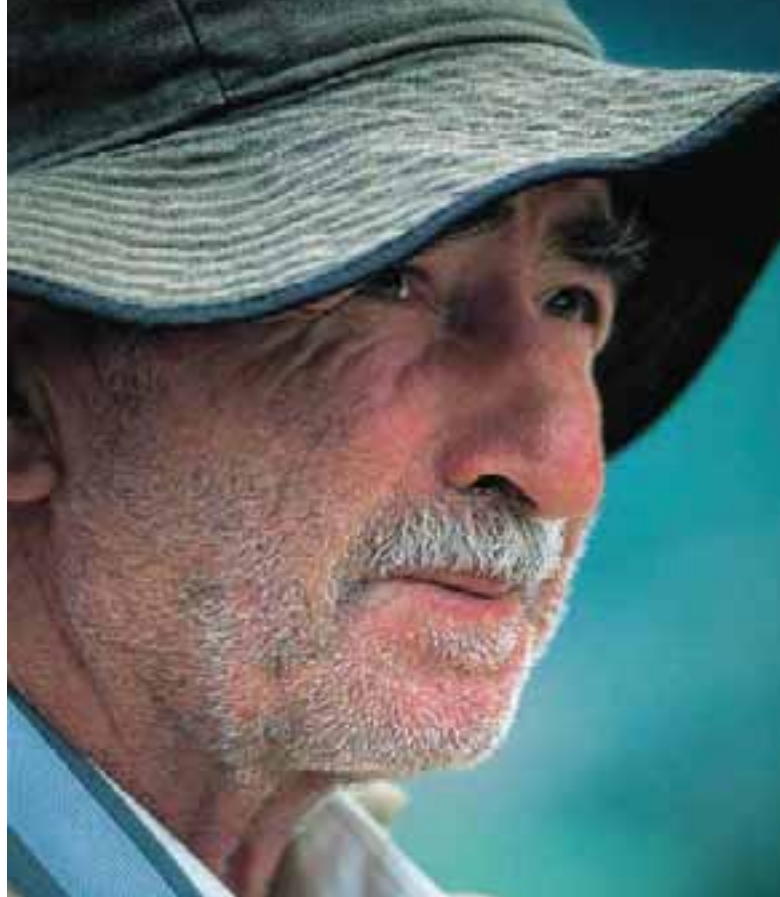
THE ECOSYSTEM APPROACH SHOULD INVOLVE ALL RELEVANT SECTORS OF SOCIETY AND SCIENTIFIC DISCIPLINES

The daily lives of farmers, pastoralists, rural and urban people from all different cultures are closely interrelated and are complementary to their use of the natural resources and food production and consumption (Chapters 1, 2, 8). Many scientific institutions, policy-makers, universities and farmers' and consumers' networks are collaborating to maintain in situ and ex situ the precious genetic resources that will allow them to ensure sustainable food production in the Southern Caucasus.

RECOMMENDATION

New vigour, enabling policies, committed researchers and empowered farmers must work together across sectors, across cultures and across countries to protect the enormous amount of genetic material that is preserved in the Southern Caucasus. For this to happen, it is important for people, in particular decision and policy makers, to internalize issues related to the conservation, sustainable use and the fair sharing of benefits arising from the utilization of genetic resources into their daily work. It is also important to engage with needs of farmers, who are the custodians of genetic resources. Adequate investments in rural infrastructures, efficient technologies, education and development are vital in order to meet the demand for food in the twenty-first century, with a particular focus on environmental sustainability.











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The Southern Caucasus is an important centre of origin and diversity of many species and varieties that are the basis for global food production. This great biodiversity is maintained by farmers, and their gardens are a healthy source of food production, experimental places to develop sustainable technologies and laboratories to maintain seeds and biodiversity.

This book contains 500 photos and documented information on selected species that hold potential to adapt to the production systems of the twenty-first century. It also contains studies and notes on the food habits and associated traditions of the people of the Southern Caucasus, who contribute to maintaining sustainable agricultural systems through their daily work and diligence.

The time has come to awaken and engage in identifying, maintaining and using these genetic resources and agricultural practices. This will enable the present and future generations to improve their food security and livelihood in the Southern Caucasus while ensuring that other countries will also have access to this treasure trove of biodiversity.

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