



GARDENS *of* BIODIVERSITY

*Conservation of
genetic resources and their use in
traditional food production systems
by small farmers of
the Southern Caucasus*









Caterina Batello

*Senior Agricultural Officer, FAO
Plant Production and Protection Division, Rome*

Damiano Avanzato

*Senior Researcher
Centro di Ricerca per la Frutticoltura (CRA), Rome*

Zeynal Akparov

*Director, Genetic Resources Institute
Azerbaijan National Academy of Sciences (ANAS), Baku*

Tamar Kartvelishvili

*Deputy Chief of SC
Georgian National Association for Animal Production (GNAAP), Tbilisi*

Andreas Melikyan

*Doctor Professor, Head of the Department of Plant and Vegetable Breeding
State Agrarian University of Armenia, Yerevan*

GARDENS *of* BIODIVERSITY

*Conservation of
genetic resources and their use in
traditional food production systems
by small farmers of
the Southern Caucasus*

Photographs by Marzio Marzot

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views of FAO.

ISBN 978-92-5-106613-3

All rights reserved. FAO encourages reproduction and dissemination of material in this information product. Non-commercial uses will be authorized free of charge, upon request. Reproduction for resale or other commercial purposes, including educational purposes, may incur fees. Applications for permission to reproduce or disseminate FAO copyright materials, and all other queries concerning rights and licences, should be addressed by e-mail to copyright@fao.org or to the Chief, Publishing Policy and Support Branch, Office of Knowledge Exchange, Research and Extension, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy.

© FAO 2010



CONTENTS

- ix FOREWORD
- xiii PREFACE
- xvi ABOUT THIS BOOK

1 AT THE CROSSROADS BETWEEN EAST AND WEST

- 2 INTRODUCTION
- 3 TERRITORY
- 9 CLIMATE
- 11 LANDSCAPES
- 13 A CENTRE OF GENETIC EVOLUTION AND DIFFERENTIATION
- 20 HUMAN IMPACT AND ENVIRONMENTAL RISKS
- 30 CONSERVATION OF GENETIC RESOURCES AND FAO
- 32 The Commission on Genetic Resources for Food and Agriculture
- 35 HERITAGE OF GENETIC RESOURCES
- 36 The International Treaty on Plant Genetic Resources for Food and Agriculture

39 FROM INDIFFERENCE TO AWARENESS: AN ENGAGEMENT TO MAINTAIN AGRICULTURAL BIODIVERSITY FOR FOOD SECURITY

41 IN THREE HOSPITABLE COUNTRIES

- 42 INTRODUCTION
- 43 CULTURAL HERITAGE AND HOSPITALITY
- 45 ARMENIA
- 56 People of the Caucasus: Professor Papin Ghandilyan and his wife
- 57 People of the Caucasus: the teacher Frunzik
- 59 AZERBAIJAN
- 69 Biodiversity in folklore and literature
- 70 People of the Caucasus: Professor Jalal Aliyev
- 71 People of the Caucasus: the musician Vagif Mustafazadeh
- 73 GEORGIA
- 83 People of the Caucasus: the painter Levan Mosiashvili
- 84 People of the Caucasus: Professor Kamo Kartvelishvili

87 EDUCATION TO MAINTAIN LOCAL GENETIC RESOURCES

89 AGRICULTURE AND BREEDING HAVE BEEN DEVELOPED SINCE THE NEOLITHIC

- 90 INTRODUCTION
- 91 EARLY AGRICULTURE IN THE SOUTHERN CAUCASUS
- 95 Gobustan caves
- 96 THE ORIGIN OF WHEAT CULTIVATION IN THE CAUCASUS
- 97 Antiquity of grapevine cultivation in the Southern Caucasus
- 104 FRUIT DOMESTICATION
- 119 THE ORIGIN OF LEGUME-GROWING PRACTICES
- 124 ARCHAEOLOGY OF LIVESTOCK KEEPING
- 127 DIVERSIFICATION FOR ADAPTATION

129 COPING WITH THE RHYTHMS OF THE SEASONS

- 130 INTRODUCTION
- 131 SEASONAL FLUCTUATIONS AND FOOD PRODUCTION
- 134 ADAPTATION OF PLANTS TO SEASONAL CYCLES
- 142 ADAPTATION BY PEOPLE: FOOD PRESERVATION
- 146 People of the Caucasus: Professor Nariman Zamanov
- 152 A Georgian recipe for tklapı
- 154 ADAPTATION BY PEOPLE: CULTIVATION OF CEREALS, FRUITS AND FORAGES
- 169 FARMERS CAN PRODUCE SEED ADAPTED TO CHANGES

171 A TREASURY OF GENETIC RESOURCES IS MAINTAINED IN GARDENS

- 172 INTRODUCTION
- 173 AGRICULTURAL PRODUCTION AT THE FAMILY LEVEL
- 174 HORTICULTURE AND FRUIT TREES IN THE GARDEN
- 176 Legume recovery, conservation and sustainable use of Georgia's agricultural biodiversity
- 180 People of the Caucasus: the farmer Mhrabyan and his family
- 186 People of the Caucasus: the urban gardens of Musayev family
- 200 People of the Caucasus: the farmer Ibrahimov Saodulla
- 203 ANIMALS IN THE GARDEN
- 208 SOIL FERTILITY FOR FOOD PRODUCTION
- 213 RECYCLE AND REUSE

215 TO MAKE BREAD, CHEESE AND WINE

- 216 INTRODUCTION
- 217 LINKS BETWEEN TRADITIONAL KNOWLEDGE AND LOCAL CUISINE
- 220 Women and food production
- 222 BREAD
- 233 DAIRY PRODUCTS
- 238 Support for the production and preservation of *motal* cheese in the Southern Caucasus mountains
- 240 WINE
- 248 People of the Caucasus: the vine growers Soliko Tsaishvili and Ramaz Nikoladze
- 253 LINKING PRODUCERS AND CONSUMERS

255 PASTORALISTS AND FARMERS MANAGE THE LANDSCAPES

- 256 INTRODUCTION
- 257 THE ROLE OF PEOPLE
- 259 THE ROLE OF SCIENCE
- 260 THE ROLE OF DATA
- 262 MANAGEMENT OF GRASSLANDS
- 268 MANAGEMENT OF POLLINATORS TO MAINTAIN THE PRODUCTION OF THE ECOSYSTEM
- 275 Traditional beekeeping in Azerbaijan
- 277 MANAGEMENT OF LIVESTOCK
- 282 People of the Caucasus: the buffalo farmer Yaver Bini Farajov
- 296 Wool production in the Southern Caucasus
- 300 SUSTAINABLE USE OF WATER RESOURCES
- 304 Exploitation of inland waters in the Southern Caucasus: the case of Lake Sevan
- 307 THE GUARDIANS OF BIODIVERSITY

309 RURAL PEOPLE KNOW AND USE WILD PLANTS AND ANIMALS

- 310 INTRODUCTION
- 311 THE MANY FUNCTIONS OF GENETIC RESOURCES
- 313 FOOD AND MEDICINAL PLANTS
- 322 Tradition of Armenian herbal tea culture
- 325 WILDLIFE AND HUNTING
- 328 FISHERIES IN THE SOUTHERN CAUCASUS
- 337 People of the Caucasus: the fish breeder Ashot Kochryan
- 339 TREES AND FOREST RESOURCES
- 340 Sustainable mountain development in Armenia
- 348 People of the Caucasus: the forestry technician Giorgi Ichaizde
- 351 TOWARDS RESOURCE EFFICIENCY

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

EDITORIAL STAFF

AUTHORS

Caterina Batello, Damiano Avanzato, Zeynal Akparov, Tamar Kartvelishvili, Andreas Melikyan

PHOTOS

Marzio Marzot

DESIGN AND EDITORIAL COORDINATION

Pietro Bartoleschi

EDITORS

Caterina Batello, Nadine Azzu

LAYOUT

Pietro Bartoleschi and Arianna Guida

DESIGN CONTRIBUTION

Sabrina Varani, Loretta Di Paola and Elena Pisano (studio Bartoleschi)

ENGLISH EDITOR

Roberta Mitchell

COORDINATION OF INPUTS AND OVERALL CHECKING

Suzanne Redfern, Emanuela Cattaneo

PREPARATION, PRODUCTION AND DISTRIBUTION OF THIS BOOK HAVE BEEN MADE POSSIBLE THANKS TO THE SUPPORT AND TECHNICAL INPUT FROM:



FAO REGIONAL OFFICE
FOR EUROPE AND CENTRAL ASIA

FAO SUBREGIONAL OFFICE
FOR CENTRAL ASIA



FAO/NETHERLANDS
PARTNERSHIP PROGRAMME
ON AGRICULTURAL BIODIVERSITY
&
FAO INTERDEPARTMENTAL
WORKING GROUP
ON BIODIVERSITY
FOR FOOD AND AGRICULTURE



SWISS FEDERAL OFFICE OF AGRICULTURE



CONTRIBUTIONS

Michele Bernardi

Natural Resource Management Officer (agrometeorology), FAO Natural Resources Management and Environment Department

Shakeel Bhatti

Secretary, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), FAO Agriculture and Consumer Protection Department

Renato Cumani

Environment Officer, FAO Natural Resources Management and Environment Department

Mark Lawrence Davis

Senior Officer (Pesticide Management), FAO Plant Production and Protection Division

Rubina Devrykian

National Consultant on community/local institutions development, FAO Technical Cooperation Programme

Barbara Gemmill-Herren

Global Project Coordinator, FAO Plant Production and Protection Division

Thomas Hofer

Forestry Officer (Conservation and Hydrology), FAO Forest Assessment, Management and Conservation Division

John Latham

Senior Environment Officer (Geospatial), FAO Natural Resources Management and Environment Department

Monica Petri

Agronomy/Agricultural Science Consultant, FAO Natural Resources Management and Environment Department

Álvaro Toledo Chavarri

Officer of the Secretariat of the ITPGRFA, FAO Plant Production and Protection Division

Raymon Van Anrooy

Fisheries and Aquaculture Officer, FAO Subregional Office for Central Asia

and

Valerio Borgianelli Spina

Secretary of Slow Food International, Rome

Francesco Cattaneo

Project Manager, "Leadership in Energy and Environmental Design" © Accredited Professional

Lorenzo Costantini

Bioarchaeological Research Center, Istituto Italiano per l'Africa e l'Oriente e Museo Nazionale d'Arte Orientale

Akif Farajov

President of the National Association of Buffaloing of Azerbaijan

Yagub Guliev

Head of Department, Agrarian Science Center of Azerbaijan

Syuzanna Hovsepyan

Junior Researcher, State Agrarian University of Armenia

Gabil Imamaliyev

Advisor of Director, Genetic Resources Institute, Azerbaijan National Academy of Sciences

David Maghradze

Head of the Department of Grapevine and Fruits Germplasm Research, Genetics and Breeding, Institute of Horticulture, Viticulture and Oenology

Afig Mammadov

Head of Department of International Relations, Coordination and Information, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Marzio Marzot

Photographer

Armen Mehrabyan

International Expert on Agriculture Crisis and Rural Agriculture Development

Mirza Musayev

Head of Laboratory of Subtropical Crops, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Peter Naskidashvili

Head of State Inspection on Variety Testing and Protection of Breeding Achievements

Ramaz Nikoladze

European Union Security Service and traditional wine producer

Roza Nozadze

Professor, Georgian Zootechnical-Veterinary University

Victoria Smelkova

Slow Food International, Rome

Soliko Tsaishvili

Doctor of Philology, editor and redactor of the journal "Literature and Art". Translator from German and Russian and traditional wine producer

Levan Tortladze

Professor, Georgian Zootechnical-Veterinary University/ Georgian National Association for Animal Production

Nariman Zamanov

Professor, Expert in Sturgeon Breeding and Caviar Production

TECHNICAL SUPERVISION

Nadine Azzu

Agricultural Officer (Crop Biodiversity), FAO Plant Production and Protection Division

Linda Collette

Senior Officer (Sustainable Intensification, Biodiversity and Ecosystem Services), FAO Plant Production and Protection Division

Kakoli Ghosh

Agriculture Officer, FAO Plant Production and Protection Division

Elcio Perpétuo Guimarães

Research Director for Latin America and the Caribbean, International Center for Tropical Agriculture

Alison Hodder

Senior Officer (Horticultural Crops), FAO Plant Production and Protection Division

Peter Kenmore

Principal Officer, FAO Plant Production and Protection Division

Damiano Luchetti

Programme Officer, FAO Natural Resources Management and Environment Department

Shivaji Pandey

Director, Plant Production and Protection Division, FAO Agriculture and Consumer Protection Department

Dafydd Pilling

Animal Production Officer, FAO Animal Production and Health Division

Beate Scherf

Domestic Animal Diversity Information System (DAD-IS), FAO Animal Production and Health Division

ACKNOWLEDGEMENTS

THE FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS WISHES TO ACKNOWLEDGE THE COLLABORATION OF THE MANY INDIVIDUALS LISTED BELOW WHO CONTRIBUTED TO THIS PUBLICATION. IN ADDITION, THE ORGANIZATION WOULD LIKE TO THANK THE MANY UNNAMED LOCAL PEOPLE MET SINCE 2002 IN ARMENIA, AZERBAIJAN AND GEORGIA WHO SHARED THEIR TRADITIONS AND KNOWLEDGE, AND DEMONSTRATED THEIR PRIDE IN THEIR ACHIEVEMENTS.

ARMENIA

Armine Abrahamyan

Ph.D. student, State Agrarian University of Armenia

Andranik Andreasyan

Ministry of Agriculture

Alvina Avagyan

State Agrarian University of Armenia

Samvel Avetisyan

First Deputy Minister, Ministry of Agriculture

Tigran Chitchyan

State Agrarian University of Armenia

Brian Ahmed Davati

Local farmer

Michael Gyulkhasyan

Professor, Head of Laboratory of Plants Gene Pool and Breeding, State Agrarian University of Armenia

Levon Gyulkhasyan

Agricultural Specialist, United States Department of Agriculture in Armenia

Almast Hovhannisyan

Translator, State Agrarian University of Armenia

Alexander Kalantaryan

Officer for Armenia, International Fund for Agricultural Development

Yuri G. Marmarian

Pro-Rector, Education Department, State Agrarian University of Armenia

Gagik Matevosyan

Former Project Director for Armenia, International Fund for Agricultural Development

Haik Mirzoyan

State Agrarian University of Armenia

Tigran Mnatsakanyan

Daniel P. Petrossyan

Head of Scientific Center, Vice-Rector, State Agrarian University of Armenia

Frunzik Tadevosyan

Teacher and bookseller

Haykaz Terteryan

Chief of Lusarat village

Gurge Yeghiazaryan

State Agrarian University of Armenia

AZERBAIJAN

Firundin Ahmadov

Chief Advisor of the Executive Branch of Astara region

Hasan Aliyev

Interpreter, Translator and Guide

Jalal Aliyev

Academician of the Azerbaijan National Academy of Sciences, Head of the Department of Plant Physiology and Biotechnology, Institute of Agriculture, Agrarian Science Center, Ministry of Agriculture. Head of the Department of Fundamental Problems of Biological Productivity, Institute of Botany of the Azerbaijan National Academy of Sciences

Oruj Aliyev

Deputy Director, Institute of Folklore, Azerbaijan National Academy of Sciences

Naib Aminov

Deputy Director, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Ogtay Asadov

Chairman of the Milli Mejlis (Parliament of Azerbaijan)

Shamsaddin Asadov

Head of Laboratory of Technical, Forage and Medicinal Crops, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Ganira Azimova

Head of Laboratory of Livestock Genetic Resources, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Ilyas Babayev

Correspondent Member of the Azerbaijan National Academy of Sciences, Professor, Head of Department, Institute of Archaeology and Ethnography, Azerbaijan National Academy of Sciences

Maharram Babayev

Director of the Institute of Soil and Agrochemistry, Azerbaijan National Academy of Sciences

Mammad Balakishiyev

Director of Livestock Growing Institute, Agrarian Science Center, Ministry of Agriculture

Dilshad Bayramova

Head of Department of Fruit and Fruit-berry Genetic Resources, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Agshin Dadashzade

Interpreter and Translator

Fakhrat Eminov

Deputy Head of the Animal Production Department, Ministry of Agriculture

Elmira Fahrajova

Junior Scientific Worker at the Livestock Laboratory

Akhmadov Firundin

Chief Advisor of the Executive Branch of Astara region

Agali Gasimov

Farmer from Altiaghaj Village

Abdulalyeva Gulshan

Scientific Worker, Genetic Resources Institute

Ayaz Mammadov

Training and Innovation Specialist, State Agency on Agricultural Credits under the Ministry of Agriculture, Author of AgroWeb portal

Ehtiram Mammadov

Land Agrochemist

Emin Mekhtizadeh

Head of Laboratory, Genetic Resources Institute, Azerbaijan National Academy of Sciences

Asad Musayev

General Director, Agrarian Science Center, Ministry of Agriculture

Cavanşir Qurbanov

Head of Sheki Regional Department of Agriculture

Jabbar Sattarov

Head of Laboratory, Research Institute of Forage, Meadows and Pasture, Agrarian Science Center, Ministry of Agriculture

Savalan Seyfaddinov

Senior Advisor of the Livestock Department, Ministry of Agriculture

GEORGIA

Tea Abramishvili

Kakha Altunashvili

Ilia Archemashvili

Majority Deputy of Tianeti District,
Member of Georgian Parliament

Anzor and Tina Begauri

Local farmers

Khatuna Beyelauri

Laboratory of Vertebrate Animals
Zoology, Institute of Zoology

Rosa Bidzinashvili

Medicinal Plant Curator,
Tbilisi Botanical Garden

Zviad Bobokashvili

Georgian Research Institute of
Horticulture, Viticulture and
Oenology

Giorgi Chaladze

Assistant, Laboratory of Entomology,
Institute of Zoology

Eteri Dimanidze

Georgian National Museum

Megi Gamrakilidze

Local farmer

Zaal Gamtseimidze

First Deputy Chairman of
Environment Protection and Natural
Resources of Georgia

Muradi Gogoladze

Elkana Biological Farming
Association (NGO),
Samtskhe-Javakheti region

Giuli Gogoli

Institute of Biological Basis of
Cattle Breeding

Khatuna Gogorishvili

Member of Parliament of Georgia,
Chairperson of the Committee on
Procedural Issues and Rules

Ekaterine Gogniashvili

Member of Georgian Animal
Genetic Resources Working Group

Amiran Goyazde

Guide of the Rioni River

Irakli Iakobashvili

Georgia Academy of Science

Mindia Jalabadze

Georgia State Historical Museum

Mariam Jokhadze

Zura Karcivadze

Guide

Levan Kartvelishvili

Manager of Content
Delivery Network

Nino Kishmareishvili

President of the Georgian National
Association for Animal Production

Nato Kohkreidze

Former Officer from Ministry of
Agriculture of Georgia

Irina Kokhreidze

Guide

Natia Kopaliani

Noah's Ark Center for the Recovery
of Endangered Species

Temur Kurtanidze

Samtskhe-Javakheti region
Horticultural Center of the Georgian
Research Institute of Horticulture,
Viticulture and Oenology

Eristo Kvavadze

Head, Laboratory of
Invertebrate Animals Zoology,
Institute of Zoology

George Kvesitadze Durmishidze

Institute of Biochemistry and
Biotechnology

Gia Makharashvili

Ministry of Agriculture

Nino Miruashvili

Assistant, Laboratory of
Vertebrate Animals Zoology,
Institute of Zoology

Irakli Rekhviashvili

Selection Achievement Testing
Station of Asureti

Giorgi Saghirashvili

Vice-President, Georgian National
Association for Animal Production

Barnab Sturua

Veterinary Union of Tbilisi

Goga Tchkonია

Ekaterine Tsurtsumia

National Coordinator of
Georgian Farm Animal Welfare
Webportal/ Author of Agro
Web portal

FAO

Elkhan Aliyev

Programme and Budget Officer,
Office of Strategy, Planning and
Resources Management

Tarana Bashirova

Assistant FAO Representative,
Azerbaijan

Emanuela D'Antoni

Scientific Illustrator, Fisheries and
Aquaculture Department

Parviz Koohafkan

Director, Land and Water Division,
Natural Resources Management
and Environment Department

Francisco Lopez

Support Officer, Information and
Communication, Plant Production
and Protection Division

Antonio Martucci

Information Systems Officer,
Natural Resources Management
and Environment Department

Mamuk Meskhi

Assistant FAO Representative,
Georgia

Eva Moller

Administrative Assistant, Plant
Production and Protection Division

Gayane Nasoyan

Assistant FAO Representative,
Armenia

Avetik Nersisyan

Crop Production and Plant
Protection Officer, Subregional Office
for Central and Eastern Europe

Kent Nnadozie

Senior Treaty Support Officer,
ITPGRFA, Plant Production and
Protection Division

Sergio Perciballi

Publishing Production Manager,
Conference, Council and Protocol
Affairs Division

Evgeny Saranin

Coordination Officer, Office of
Support to Decentralization

Nadia Scialabba

Senior Officer, Environment and
Sustainable Development,
Natural Resources Management
and Environment Department

Petra Staberg

Public Information Specialist, Plant
Production and Protection Division

Rachel Tucker

Publishing Planning and
Rights Manager, Publishing and
Policy Support Branch

Andi Zhamierashvili

Human Resources Officer,
Corporate Services, Human
Resources and Finance Department

OTHER

Alessandro Bozzini

Agenzia nazionale per le nuove
tecnologie, l'energia e lo sviluppo
economico sostenibile

Francesca Guiso Gallisai

Project Executive, Africa,
Caribbean and Latin America
Division, Landell Mills Ltd

Neviana Petkova

Former official translator from
Bulgarian Fruit Growing Institute

Stephen G. Reynolds

Retired Senior Officer, FAO Plant
Production and Protection Division

SUPPORT AND TECHNICAL INPUTS

Fernanda Guerrieri

Assistant Director-General and
Regional Representative, Regional
Office for Europe and Central Asia,
Hungary

Mustapha Sinaceur

Subregional Coordinator for
Central Asia, Subregional Office for
Central Asia, Turkey

Dan Leskien

Senior Liaison Officer, Commission
on Genetic Resources for Food
and Agriculture, FAO Natural
Resources Management and
Environment Department

Shakeel Bhatti

Secretary, ITPGRFA, FAO
Agriculture and Consumer
Protection Department

Hans-Jörg Lehmann

Permanent Representative of
Switzerland to FAO, IFAD
and WFP



FOREWORD

With admiration, this book is dedicated to the people of the Southern Caucasus, and to the wealth of genetic resources resulting from their inspiration and work over the centuries. In managing their natural resources, these people have made an outstanding contribution to maintaining biodiversity and, as a consequence, to global food security.

The Southern Caucasus region was paramount in the evolution and differentiation of various domesticated plant and animal species; moreover, the region saw the beginnings of farmers' and pastoralists' settlements in the early stages of agriculture. Throughout the ages, the region was home to many populations who learned how to make a living out of a rugged land, by developing skills and locally adapting techniques – such as selecting a wide range of crop varieties, livestock breeds and integrated crop-livestock systems – to adapt to cold winters, dry summers, pests, diseases and the introduction of alien species.

The valued genetic resources and variety of agricultural practices (from production to preservation) in family gardens support year-round household food security. Together, these ensure yields over the longer term, and contribute to sustainable agricultural production intensification, farmers' livelihoods, healthy and diversified diets, healthy ecosystems and sociocultural stability.

Yet this sustainability, achieved through agricultural practices based on the conservation and sustainable use of local genetic resources in the Southern Caucasus, is at risk of being lost. Over the last few decades, changing biophysical and socio-economic pressures have increased risks from poor management of natural resources, loss of biodiversity, soil and water pollution and degradation, and vulnerability to climate change.

This book describes selected genetic resources and traditional management practices maintained by farmers and pastoralists in the gardens and landscapes of the Southern Caucasus, showing that understanding and building on local traditions can help these to be

Эта книга посвящается – с восхищением – людям Южного Кавказа и богатству генетических ресурсов, являющемуся плодом их вдохновения и труда на протяжении столетий. Умело распоряжаясь своими природными ресурсами, эти люди внесли выдающийся вклад в поддержание биоразнообразия и, как следствие, в глобальную продовольственную безопасность.

Регион Южного Кавказа сыграл важнейшую роль в эволюции и изменении различных одомашненных видов растений и пород животных; более того, на ранних стадиях развития сельского хозяйства регион стал свидетелем появления поселений земледельцев и скотоводов. На протяжении веков регион служил домом для многих групп населения, которые научились добывать средства к существованию на холмистой земле, вырабатывая навыки и приспособлявая к местным условиям такие технологии, как селекция широкого спектра разнообразных сельскохозяйственных культур, пород домашнего скота и интегрированных систем сельскохозяйственных культур и домашнего скота, с целью приспособиться к холодной зиме, жаркому лету, сельскохозяйственным вредителям, болезням и внедрению чужеродных видов.

Ценные генетические ресурсы и разнообразие сельскохозяйственных практик (от производства до сохранения) на приусадебных участках поддерживают продовольственную безопасность домашних хозяйств круглый год. Сообща они обеспечивают урожаи в более длительной перспективе и способствуют интенсификации устойчивого сельскохозяйственного производства, средствам к существованию, здоровому и разнообразному питанию фермеров, жизнестойким экосистемам и социокультурной стабильности.

Однако, возникла опасность, что эта устойчивость, достигнутая благодаря сельскохозяйственным практикам, основанным на сохранении и устойчивом использовании местных генетических ресурсов на Южном Кавказе, будет утрачена. В течение нескольких последних десятилетий изменение биофизического и социально-экономического давления привело к возрастанию рисков, связанных с неудовлетворительным управлением природными ресурсами, утратой биоразнообразия, загрязнением и деградацией почвы и воды, а также с уязвимостью по отношению к изменению климата.



valued, and also help to capitalize on what they have to offer. A close, detailed study of local agro-ecological and social conditions can contribute to identifying solutions for global problems; in short, it is possible to build on the knowledge and selection of the best genetic resources and local practices combined with efficient technologies and science to transform and increase options for agriculture in the Southern Caucasus towards sustainable development.

The genetic material treasured in the Southern Caucasus is essential for the achievement of Millennium Development Goals 1 and 7 in the region and for the entire world; collective efforts need to be made to preserve and use it.

Special thanks must be given to the many Armenian, Azeri and Georgian contributors to the book. The material they have collected, as well as that collected by the authors, was so extensive and rich that the editors have had the uneasy task of making a rigid selection – as diversified and as balanced as possible – of the many examples of plant and animal genetic resources that farmers and pastoralists have maintained, and of their traditional management practices. Additional and more detailed information on each subject can be found in the bibliography at the end of each chapter and at the following link: www.fao.org/agriculture/gardens_of_biodiversity

Thanks must also be given to the FAO Regional Office for Europe and Central Asia, the FAO Subregional Office for Central Asia, the FAO Commission on Genetic Resources for Food and Agriculture,

В книге описываются отдельные генетические ресурсы и традиционные агротехнические приемы, применяемые земледельцами и скотоводами на Южном Кавказе, и показано, что понимание местных традиций и опора на них может помочь правильно их оценить, а также с пользой задействовать их потенциал. Тщательное, детальное изучение местных агро-экологических и социальных условий может содействовать поиску решения глобальных проблем. Короче говоря, имеется шанс опереться на знание и выбор наилучших местных ресурсов, практик и эффективных технологий на Южном Кавказе с целью изменить и расширить возможности сельского хозяйства в плане устойчивого развития.

Генетический материал, бережно сохраненный на Южном Кавказе, существенно важен для достижения как в регионе, так и во всем мире Целей развития, сформулированных в Декларации Тысячелетия (Цели # 1 и # 7); нужны коллективные усилия для сохранения и использования этого материала.

Особую благодарность следует выразить многим специалистам из Армении, Азербайджана и Грузии, которые внесли свой вклад в создание этой книги. Собранный ими материал, как и материал, собранный авторами, был настолько обширным и богатым, что перед редакторами встала нелегкая задача провести строгий отбор – максимально возможно разносторонний и сбалансированный – среди множества примеров генетических ресурсов растений и животных, сохраненных земледельцами и скотоводами, и среди их традиционных агротехнических приемов. Дополнительную и более подробную информацию по каждому предмету можно найти в библиографии и на сайте www.fao.org/agriculture/gardens_of_biodiversity



the International Treaty on Plant Genetic Resources for Food and Agriculture and the Government of Switzerland for their generous support to this book, as one of FAO's contributions to the 2010 International Year of Biodiversity.

We would further like to acknowledge the work, guidance and support of Shivaji Pandey, Director, FAO Plant Production and Protection Division; Fernanda Guerrieri, Assistant Director-General and Regional Representative for the FAO Regional Office for Europe and Central Asia; Mustapha Sinaceur, Subregional Coordinator of the FAO Subregional Office for Central Asia; Dan Leskien, Senior Liaison Officer, FAO Commission on Genetic Resources for Food and Agriculture; Shakeel Bhatti, Secretary of the International Treaty on Plant Genetic Resources for Food and Agriculture; Hans-Jörg Lehmann, Swiss Permanent Representative to FAO, IFAD and WFP, and the many FAO colleagues who have contributed to this publication.

Modibo T. Traoré

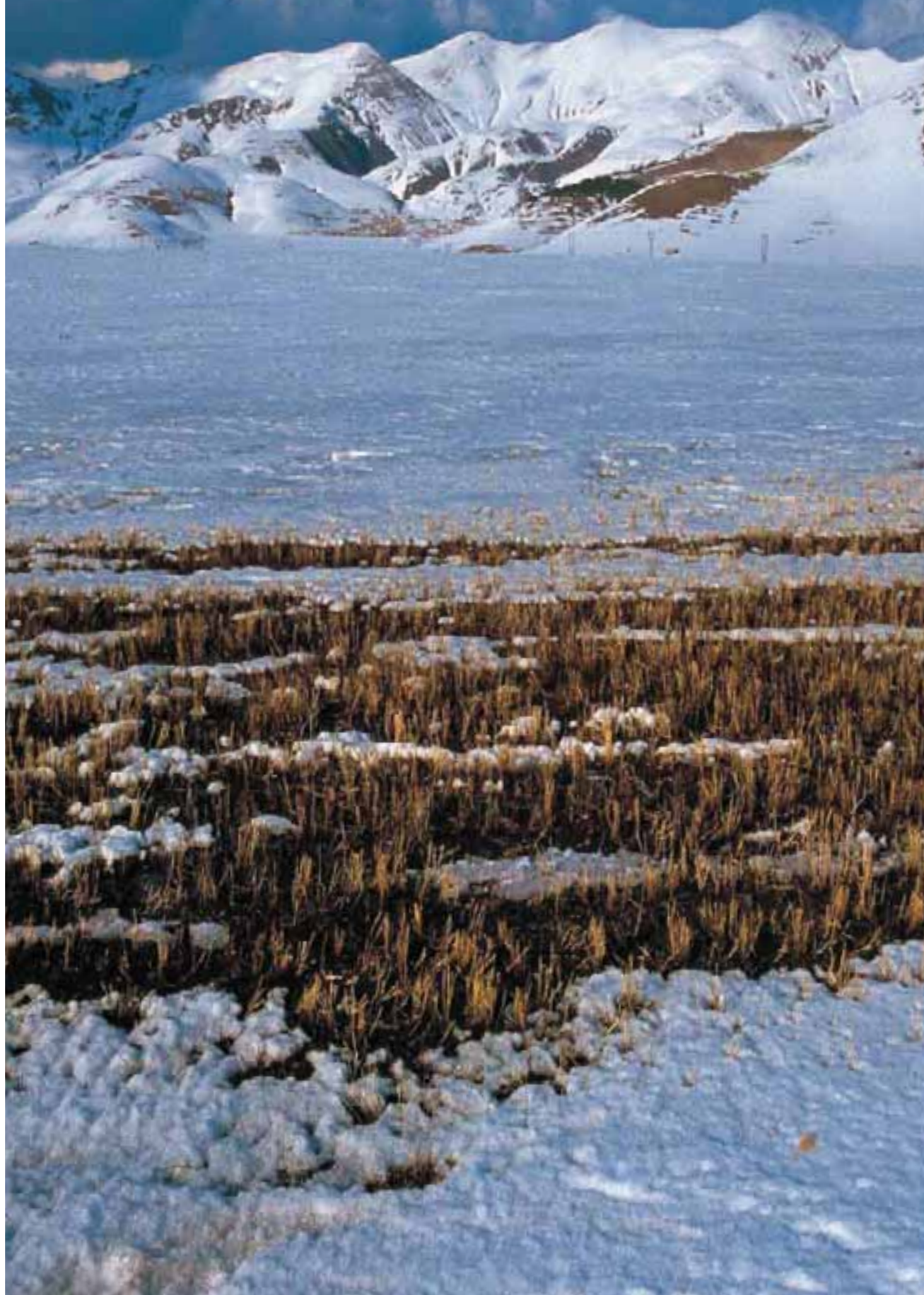
Assistant Director-General
Department of Agriculture and Consumer Protection

Следует выразить благодарность также и Региональному Бюро ФАО по Европе и Центральной Азии, Субрегиональному офису ФАО по Центральной Азии, Комиссии ФАО по генетическим ресурсам для производства продовольствия и ведения сельского хозяйства, Международному договору о генетических ресурсах растений для производства продовольствия и ведения сельского хозяйства и Правительству Швейцарии за их щедрую поддержку этой книги - в качестве одного из вкладов ФАО в отмечаемый в 2010 г. Международный год биоразнообразия.

Далее, мы также хотели бы выразить признательность за работу и консультации Фернанде Герриери, Заместителю Генерального Секретаря и Региональному представителю в Региональном Бюро ФАО по Европе, Мустафе Синакеру, Субрегиональному Координатору офиса ФАО по Центральной Азии, Гансу-Йоргу Леманну, Постоянному Представителю Швейцарии в ФАО, Шакиль Бхатти, Секретарю Международного договора о генетических ресурсах растений для производства продовольствия и ведения сельского хозяйства, Дэну Лескину, Старшему сотруднику по связям, Комиссия ФАО по генетическим ресурсам для производства продовольствия и ведения сельского хозяйства, Шиванджи Панджей, Директору Управления ФАО по производству и защите сельскохозяйственных культур, а также многим коллегам из ФАО, чьи имена указаны в списке лиц, внесших свой вклад в создание этой книги.

Модибо Т. Траоре

Заместитель Генерального Секретаря
Департамент ФАО по вопросам сельского хозяйства и защиты потребителей



PREFACE

GENETIC RESOURCES: LINKING FOOD, AGRICULTURE AND ECOSYSTEMS

There are still over a billion hungry people in the world today, and the resources with which to feed these people are becoming scarcer. Agricultural production systems need to focus more on the effective management of biodiversity and ecosystem services in order to conserve biodiversity and safeguard the environment, while feeding the global population. This is especially true in light of global challenges such as ensuring food security, climate change, shifts in population distribution and consumer preferences for food as well as potentially rising energy prices. Well-managed ecosystems are essential for ensuring a healthy resource base on which to intensify sustainably, to ensure that enough food is produced from now until 2050 – and beyond.

Biodiversity and its sustainable use and management are fundamental not only for providing food, but for maintaining and enhancing well-managed agro-ecosystems which in turn are necessary for healthy food production.

The role of biodiversity and the genetic resources it carries is essential for ensuring food security, sustainable livelihoods, ecosystem resilience, coping strategies for climate change, adequate nutritional requirements, insurance for the future (for example, for crop and animal breeding) and the management of biological processes needed for sustainable agricultural production.

With farming practices shifting away from heavy dependency on non-renewable inputs and chemical-based intensification (such as monocultures or the overuse of pesticides and fertilizers), the management of biological processes (such as pest regulation and control, soil biological processes and pollination) is increasingly becoming a recognized option for sustainable agricultural production intensification.

Agricultural systems are by far the largest managed ecosystems in the world. This gives farmers an ever-increasing role in maintaining and enhancing agricultural biodiversity and in providing the wider community with a range of ecosystem services. Farmers are the largest group of natural resource managers on the Earth. They both depend on and generate a wide array of biodiversity and ecosystem services. Their actions can enhance or degrade ecosystems. Farmers' knowledge is therefore very important in understanding what drives their decisions in all aspects of agricultural production, the sustainable use of biodiversity, the role of the biological process in sustainable agricultural production intensification, and the enhancement of ecosystem functions.

Globally, conserving genetic diversity both *in situ* and *ex situ*, and managing biodiversity *in situ*, are important, in order to capitalize on those traits that are adapted to specific conditions.

The biodiversity maintained in the Southern Caucasus is important for national food security, but also for the wider globe (for example, traits that are found in locally adapted species in the Caucasus can be adapted to suit similar climatic conditions in other geographic areas). The genetic resources found in the Southern Caucasus also play an important role in local culture, traditions and society. Despite the fact that many farmers, scientists, policy-makers and non-governmental organizations (NGOs) in the Southern Caucasus are struggling to preserve these genetic resources, their work is not sufficiently known and they are insufficiently connected with the many farmers, scientists and policy-makers of other countries who could share the benefits deriving from using these genetic resources for their agriculture.

One of the greatest challenges to achieving food security is recognizing – and internalizing into concrete action – the longer-term perspective of environmental sustainability. This is important for farmers, but also critical for policy-makers (at all levels – national, regional and international), to make informed decisions that have a positive impact on farmers' livelihoods, the health of the population, the health of the environment and, ultimately, food security.

Effective policy should provide an enabling environment for different sectors to have a favourable impact on sustainable agricultural production intensification, and therefore also on farmers. Hence, the management of natural resources, including biological processes, biodiversity and the ecosystem services it provides, becomes essential not only at the farm level, but also at the policy level.

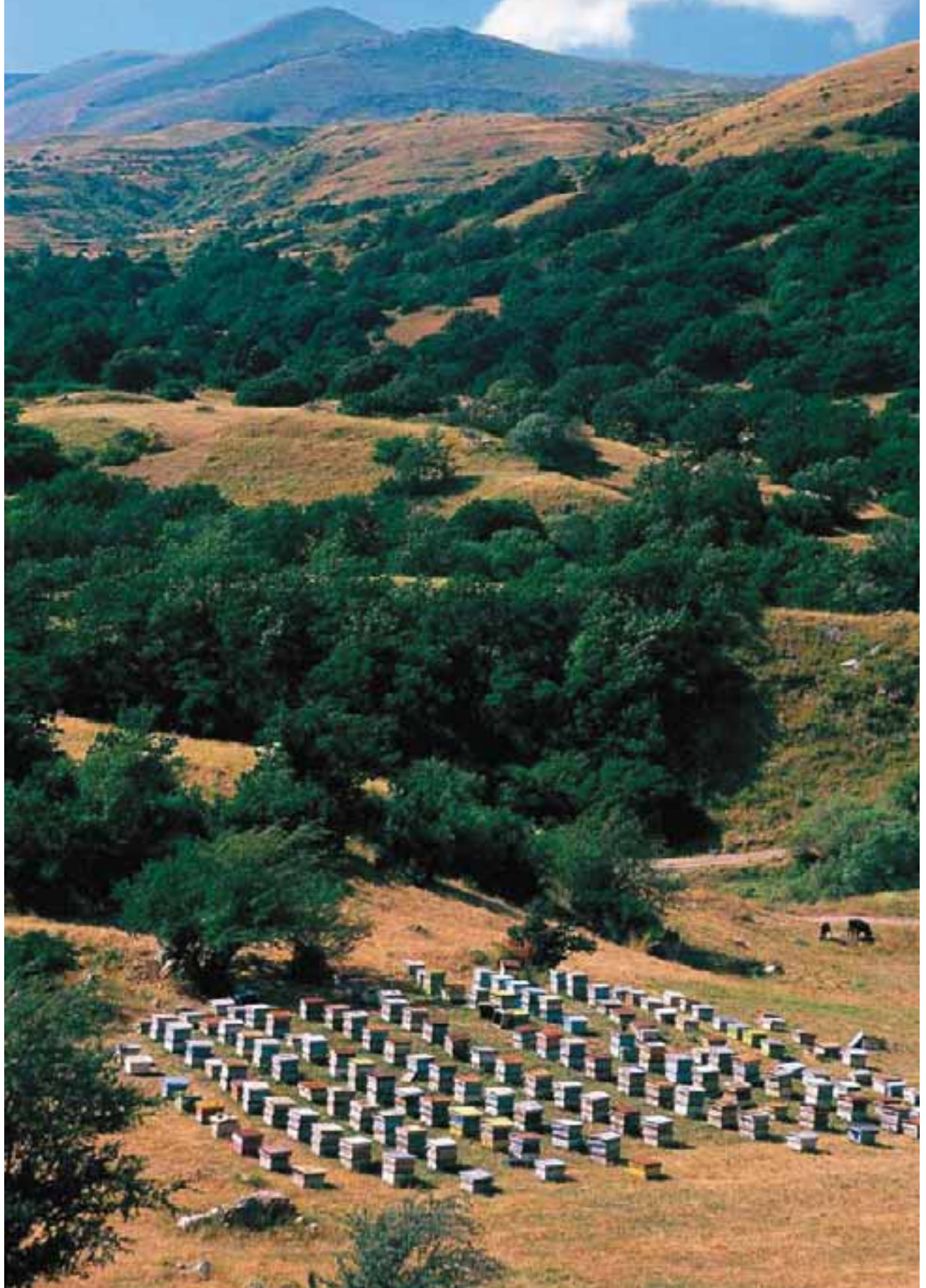
In a world of global changes, a collective effort is necessary to recognize the geographic interdependence between countries and regions.

There is a need to expand beyond national boundaries and promote international collaboration, develop joint research and breeding programmes, promote exchange and develop and strengthen collaboration programmes. This is particularly salient when facing the need to intensify agricultural production sustainably through applying ecosystem approaches.

Peter Kenmore and Linda Collette

Co-chairs

FAO Interdepartmental Working Group on Biodiversity





ABOUT THIS BOOK

THIS BOOK DESCRIBES HOW FARMERS AND RURAL PEOPLE IN THE SOUTHERN CAUCASUS MAINTAIN BIODIVERSITY AND APPLY THE ECOSYSTEM APPROACH IN THEIR DAILY LIVES AND AGRICULTURAL PRACTICES. THESE PRACTICES CONTRIBUTE TO THEIR FOOD SECURITY AND LIVELIHOODS WHILE ALSO MAINTAINING LOCAL GENETIC RESOURCES.

This book does not claim to offer a definitive prescription for sustainable agriculture and is not an exhaustive study. It puts forth a collection of concrete examples showing how genetic resources are maintained and used by small farmers for food security in the Southern Caucasus. These examples show that the livelihoods and prospects of rural people can be improved and consolidated in a sustainable manner to face important

environmental, social and economic challenges without sacrificing the prosperity of future generations. The book would like to stimulate further debate, research and policies in the hope that bridges can be built between the sustainable use of biodiversity and genetic resources, traditional practices and ways of life, and the new technologies, demands and challenges of today's society.

THE BOOK IS DIVIDED INTO NINE CHAPTERS THAT FOLLOW A SHORT STORY IN THE FORM OF A VERSE.

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 seasons, a treasury of genetic resources is maintained in gardens to make bread, cheese and wine.

Pastoralists and farmers manage the landscapes, and 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 Երեք հյուրընկալ երկրներում Հողագործությունը և անասնապահությունը զարգացել են մոտ քարեդարյան ժամանակներից ի վեր

Հաղբահարելով տարվա եղանակների վայրիվերումները Այգիներում պահպանվում է գենետիկ պաշարների ողջ հարստությունը

Հացի, պանրի և զինու պատրաստման համար Երկրագործներն ու անասնապահները կառավարում են իրենց հողակտորները Գյուղացիները քաջատեղյակ են վայրի բույսերի ու կենդանիների օգտագործման գաղտնիքներին

Էկոհամակարգային մոտեցումը կարող է հիմնարար դեր խաղալ

Տարածքի և ժամանակի ճշգրիտ կառավարումը Արևմտյան Եվրոպայի և Արևելյան Ասիայի օրինակներով

Fossilərin ahənginə uyğunlaşma Genetik ehtiyatlar xəzinəsi bağlarda saxlanılır Çörək, pendir və şərab hazırlanması

Otlaq istifadəçiləri və fermerlər landşaftı idarə edirlər Kənd əhalisi yabanı bitkiləri və vəhşi heyvanları tanyur və onlardan istifadə edir

Biomüxtəlifliyin, sağlam ekosistemlərin və xırda fermer öhdəliklərinin məcmusu: gələcəyə aparın yol

առնչվածության և անասնապահության զգուշացումը համապատասխան է կենսաբանական ռեսուրսների պահպանմանը և արտադրությանը

Սեզոնային փոփոխությունների հետ հարմարվելու համար այգիներում պահպանվում է գենետիկ պաշարների ողջ հարստությունը

միջավայրի փոփոխությունների հետ հարմարվելու համար կենսաբանական ռեսուրսների պահպանումը և արտադրությունը

Բիոմալեռնային, առողջ օրգանիզմների և փոքր ֆերմերների օգնությամբ կարող է իրականացվել





1 AT THE CROSSROADS BETWEEN EAST AND WEST

The Caucasus is a geographic hinge that connects Europe and Asia. It is characterized by the imposing mountain ranges that give their name to the region. This book focuses on the southern slopes of the Caucasus range and the nearby areas located between the Black and the Caspian Seas. The high mountains (over 5 000 m) provide protection from the excesses of the northern continental climate, but the variety of lands and soils (mountains, plains, lowlands and seashores) creates a unique combination of different climates, ranging from dry to humid and from subtropical to alpine. Due also to these features, the Southern Caucasus has been identified as one of the centres of origin of many plant species, such as soft wheat, and a centre of genetic differentiation. Like other areas in the world, the Southern Caucasus is experiencing the negative effects of weak past policies and ecosystem management, pollution, overexploitation and, more recently, climate change. But the Southern Caucasus is also a land of hope: throughout its varied territories, people and institutions are willing to restore and maintain their resources and biodiversity.

2 IN THREE HOSPITABLE COUNTRIES

The territory of the Southern Caucasus is shared by three countries: Armenia, Azerbaijan and Georgia (throughout the book the names of the three countries are generally listed in alphabetical order). Their identities are closely linked with the characteristics of the region: they are different yet similar. They share common features but have their individual properties; all three are rich in history, culture and natural resources. Armenia is in the centre of the region, and is the smallest of the three countries. It is landlocked but hosts the largest freshwater reservoir of the region (Lake Sevan). Azerbaijan lies to the east and south and faces the Caspian Sea. It is the largest country of the three. Georgia lies to the northwest, facing the Black Sea. It has the highest peak in the Southern Caucasus (Mount Shkhara, 5 201 m). Population density is comparable for the three countries (80–100 inhabitants/km²).

3 AGRICULTURE AND BREEDING HAVE BEEN DEVELOPED SINCE THE NEOLITHIC


Besides being one of the centres of origin and of differentiation of plant species, the Southern Caucasus is also an area in which agriculture and breeding were first developed, about 10 000 to 5 000 years ago, in the Neolithic. There is significant evidence of such an early presence of farmers and cattle breeders throughout the region. The cultivated species found include several varieties of wheat, apples, apricots, pears, grapes, peas and beans. Agriculture and breeding flourished over the centuries, but many local varieties are currently at risk of extinction. It is important to maintain the genetic resources and integrate state-of-the-art information and technologies with traditional practices that proved to be so efficient in the past.

4 COPING WITH THE RHYTHMS OF THE SEASONS

The Southern Caucasus stretches from west to east along a narrow range of latitudes, between 38° and 43° north. As a result, its many different climatic patterns, determined by the variety of chorography, influence of seas, etc., share the common rhythm of the four yearly seasons. Over the centuries, plants and animals have adapted to this rhythm and to the different climates, and people have had to adapt their farming practices to cope with these changes for a sustainable living. For example, in colder climates, specific varieties have been selected, such as the winter apple, and many methods of preserving food (such as jams, syrups, dry meat and dry bread – the *lavash*) have been developed in order to withstand the long winters. The rich biodiversity of the Southern Caucasus, concentrated in such a small territory, could become a natural laboratory for the maintenance and diffusion of precious genetic material and to face climate changes.

5 A TREASURY OF GENETIC RESOURCES IS MAINTAINED IN GARDENS

Historically, the family garden represents the basis of agricultural production in the region. The rugged territory and the presence of a significant rural population have presented perfect conditions for the diffusion of an agricultural system based on these gardens. Yet the garden is even more: it is the symbol of a lifestyle, of the deep knowledge of a territory and its resources, a continuous search for balance between exploitation and maintenance of the resources,



and adaptation to varying conditions in the short, medium and long terms. It is the guardian of biodiversity, of family life and culture. In an area of less than a hectare there are different varieties of fruit trees, vegetables, a few cows, sheep or goats, poultry, and possibly some beehives. Whoever owns and manages a garden has a treasure of knowledge and experience that must be preserved and shared. This knowledge is reflected in the consideration that farmers have for education and the commitment to allow their children to study. As a result, the three Caucasian countries, although they rank low in the world list of per capita gross domestic product, are at the top in literacy and culture indicators. The generally high level of education in the Southern Caucasus may help the success of any sustainable development policy, because it enables the people for whom it is directed to play leading roles.

TO MAKE BREAD, CHEESE AND WINE

Local transformation of agricultural products is another significant feature of the rural Caucasus. The region has an impressive range of food products that in turn form the basis of a rich and diversified cuisine. Bread is an example of how a simple chain production–transformation–consumption can help preserve biodiversity and the environment. It has been said that the Caucasus is rich in wheat and other cereal varieties, as a centre of origin and differentiation. People use these to make many kinds of bread, which are much appreciated and always part of Caucasian meals. In this sense, the circle closes: consumption sustains production. Similarly, many different types of cheese (from cow, buffalo, sheep, goat and mixed milk) are produced and consumed. Not to mention the social importance of wine, as testified by the widespread tradition of toasting.

PASTORALISTS AND FARMERS MANAGE THE LANDSCAPES

Many landscapes in the Southern Caucasus bear signs of unsustainable agricultural and breeding intensification policies, such as degradation of soils, salinization and loss of landscape heterogeneity and of biodiversity. Nevertheless, several factors could induce optimism towards the improvement of the environment, such as the widespread presence of pastoralists and farmers (about 46 percent of the population is rural). Their knowledge of traditional practices has survived over the centuries, and their good cultural level enables them to introduce, adapt and diffuse new technologies. But they need understanding and support. Conserving and using biodiversity sustainably need to become integral components of

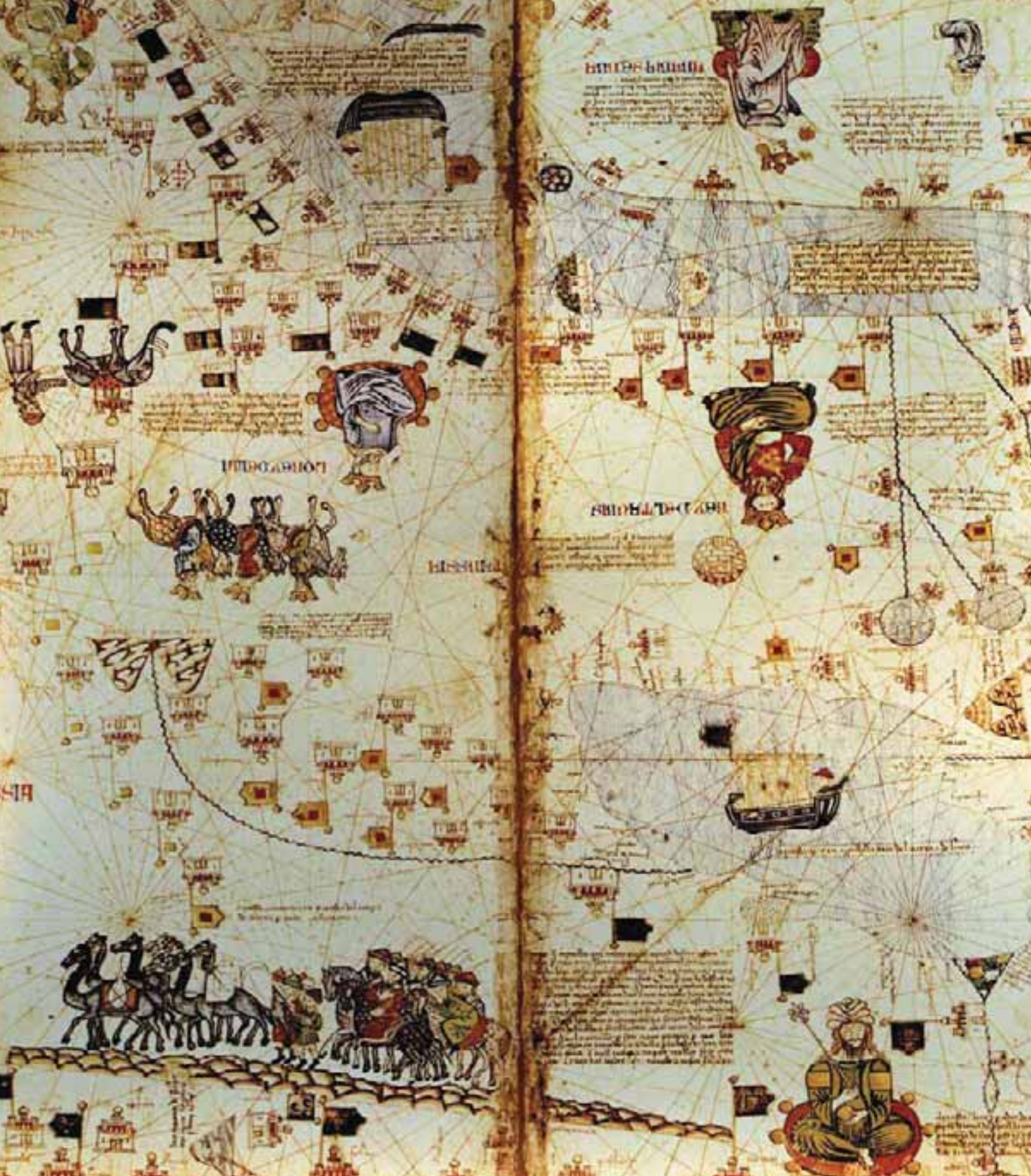
social and economic development in order to correct past policy and market failures. However, the central focus must remain on pastoralists and farmers. Their understanding of the landscapes in which they live and operate must be the starting-point for the application of modern technologies and policies.

RURAL PEOPLE KNOW AND USE WILD PLANTS AND ANIMALS

The system based on garden production is not a closed one. Cultivation and breeding are often integrated with collecting wild species and hunting. This contributes to nutritional diversity in diets and helps people overcome times of hardship such as economic, food and energy crises. Grasslands play an important role in this scenario, as they provide the right environmental conditions for the development of wild flora and fauna and represent the bridge between agriculture, animal production and nature conservation, protection and sustainable management. The Southern Caucasus is rich in grasslands, but today too many are degraded because of overexploitation and pollution. Rural populations wisely use natural resources: they just need to be supported by adequate policies.

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

The ecosystem approach is the framework for action under the Convention on Biological Diversity (CBD). It identifies 12 principles that represent the guidelines for the conservation and sustainable use of natural resources. Each principle is summarized in this chapter and connections are made to subjects developed in this book. The role of biodiversity and its genetic resources is essential for ensuring food sovereignty and food security; sustainable livelihoods; ecosystem resilience; coping strategies for climate change; and sustainable agricultural production. The Food and Agriculture Organization of the United Nations (FAO) provides a platform for dialogue and negotiation through its Commission on Genetic Resources for Food and Agriculture, to reach global consensus on policies relevant to biodiversity for food and agriculture and hosts the Secretariat for the International Treaty on Plant Genetic Resources for Food and Agriculture. FAO is assisting countries in strengthening their policies on the matter as well as in providing technical capacity to address the dual needs of food security and environmental sustainability through the ecosystem approach.



INTELLIGENTIA

LORENZUS

INTELLIGENTIA

INTELLIGENTIA

BIS



INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA

INTELLIGENTIA