Sapienza Università di Roma

Bioversity International

Mountain Partnership

SUMMER SCHOOL

GROW

AGROBIODIVERSITY IN A CHANGING CLIMATE

18 - 26 September 2019

FAO headquarters
Rome, Italy

With the technical support of the
Food and Agriculture Organization of the United Nations

GROW

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Agrobiodiversity in a Changing Climate

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SUMMER SCHOOL

Agrobiodiversity in a Changing Climate

One of the world's greatest challenges is to secure access for all to adequate supplies of food that is healthy, safe, and of high quality, and to do so in an environmentally sustainable manner. In order for this to improve, the sustainable management of natural capital must be at the forefront in food production systems. Resilient environments, sustainable production practices and the protection of agrobiodiversity can serve as avenues to improve dietary diversity and quality and, in turn, generate income for sustainable small holder farmers and aid in the restoration and preservation of ecosystems. Even more, the loss or lack of adaptive capacity in modern and commercial agriculture is a cause for concern expected impacts of climate change.

Taking into account agrobiodiversity in food systems means bringing together various sectors of science, agriculture and economy to propose new strategies of food production that can be implemented in a changing environment and proposing diversified crops and practices as a resource and increased variety as a strength in agro-ecosystems. In addition to agricultural and genetic aspects, the agrobiodiversity discussion focuses on economic and social issues such as identifying markets for biological products, developing adequate value chains and marketing strategies and preserving local crops.

The impact of investments in the agricultural sector depends significantly on the kind of interventions carried out and the type of food system that is promoted. It is essential to enable community-driven food systems that provide the best possible outcomes for producers and consumers. In this model, consumers and producers are connected through short, transparent, direct value chains, with an impact on the income of citizens. Producers are incentivized to develop or conserve quality based production models which are then rewarded with a price premium by consumers. Conversely, consumers are able to access culturally adequate, safe, nutritious food at affordable prices.

OBJECTIVES

This course focuses on the importance of biodiversity in agriculture, with particular attention to its role in enhancing resilience and adaptability of cropping and farming systems to climate change.

The lectures, based on Yale University textbook "Crop Genetic Diversity in the Field and on the Farm: Principles and Applications in Research Practices" (included as course material), illustrate principles and practices for gathering agrobiodiversity data through either participatory diagnostic or empirical approaches, and for their utilization to develop management approaches that improve resilience and adaptability.

The course analyses the economic value of agricultural biodiversity in food systems as an incentive to conservation. The most critical management aspects along the agricultural value chain are investigated, ranging from production to marketing and consumption.

The course also illustrates the best agroecology practices promoted by FAO around the world, with a specific focus on Climate Smart Agriculture and fragile ecosystems, and showcases case studies from specialized organizations and the private sector on agrobiodiversity values as market drivers.

A set of tools and methodologies for improving market access of neglected and underutilized foods and the role of gastronomic heritage as a driver for rural development are presented.

The aim of the course is to equip the participants with the necessary tools, knowledge and understanding to enhance productivity and improve marketing strategies in sustainable and resilient agricultural systems.

The training will include a field trip to a farm, which will provide hands-on experience on relevant practices.

VENUE

Ethiopia Room (C285), FAO headquarters, Via delle Terme di Caracalla, Rome, Italy

Only Saturday 21 September: Rome Botanical Garden, Largo Cristina di Svezia, 23-24

LANGUAGE

The official language is English

SCIENTIFIC DIRECTORS

Fabio Attorre – Department of Environmental Biology, Sapienza University of Rome

Devra Jarvis – Bioversity International/ Platform for Agrobiodiversity Research (PAR)

COURSE MANAGER

Valeria Barchiesi, FAO - Mountain Partnership Secretariat
Valeria.Barchiesi@fao.org

DATE & TIME

18 - 26 September 2019, from 9:00 a.m. to 6:00 p.m. every day

FEES & CREDITS

Admission fees 400 euros (including lunch, coffee breaks and course materials)

The course is worth six university credits according to the European Credit Transfer System (ECTS)

COORDINATOR

Giorgio Grussu, FAO - Mountain Partnership Secretariat
Giorgio.Grussu@fao.org

CONTACT

For more information you can write to caf_cropgeneticdiversity@uniroma1.it

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AGENDA

Agrobiodiversity in a Changing Climate

18	Wed.	MODULE 1 Management of Agrobiodiversity
19	Thu.	MODULE 1 Management of Agrobiodiversity
20	Fri.	MODULE 1 Management of Agrobiodiversity
21	Sat.	MODULE 1 Management of Agrobiodiversity
23	Mon.	MODULE 2 Agrobiodiversity on the Ground
24	Tue.	MODULE 3 Agrobiodiversity values as market drivers
25	Wed.	FIELD TRIP VALLEPIETRA
26	Thu.	MODULE 3 Agrobiodiversity values as market drivers

DAY 1

Module 1: Management of Agrobiodiversity

Wednesday, 18 September

08:45 Welcome and introductions

09:00 Crop genetic diversity, domestication and traditional varieties (Chapters 1,2,3) - *T. Hodgkin/ D. Jarvis/ M. Turdieva (Bioversity)*

Introduction to traditional varieties (pag 1 - 11)

The origins of agriculture and crops (pag 13 - 28)

Centres of crop diversity and centres of origin (pag 28 - 33)

Nature, biodiversity and genetic resources (pag 35 - 40)

10:00 Diversity and its evolution in crop populations (Chapter 4)

The nature of diversity (pag 64 -66)

Crops, varieties, and populations (pag 67 -70)

Population genetic structure (pag 71 - 77)

11:00 Coffee break

11:15 Evolution in crop varieties and populations (pag 78 - 84)

Reproductive biology (pag 84 - 89)

Crop varieties in production systems (pag 91 - 92)

13:00 Lunch break

14:00 Measuring diversity in crops (Chapter 5) *D. Jarvis/ P. Colangelo (CNR-IRET)*

Exploring extent and distribution of diversity - Agronomic, Biochemical, Molecular (pag 92 - 107)

15:00 Coffee break

15:15 Gathering data using participatory approaches (pag 108 - 118)

Designing and investigation (pag 119 - 123)

16:00 Practicum - Calculating on farm diversity indices: Richness, Evenness, Divergence

17:00 Presentations of participants

The lectures of the first module will be based on the textbook Crop Genetic Diversity in the Field and on the Farm - Principles and applications in Research Practices (see page numbers)

DAY 2

Module 1: Management of Agrobiodiversity

Thursday, 19 September

09:00 Abiotic components of agricultural ecosystem (Chapter 6) - *M. Reverberi/ F. Attorre (Sapienza)/ N. Bergamini (Bioversity)*

Abiotic and biotic components of agroecosystems (pag 126 - 137)

Farmer characterization and classification of abiotic and biotic components (pag 137 -145)

Reducing the dimensionality of complex data sets (pag 146 - 149)

Ecosystem diversity and function (pag 150 - 153)

11:00 Coffee break

11:15 Diversity in, and adaptation to, adverse environments on-farm (Chapter 7) - *P. Colangelo (CNR-IRET)/ D. Jarvis/ N. Bergamini (Bioversity)*

Evolution of crop varieties in stress prone environments (pag 154-157)

Abiotic stress and crop genetic diversity (pag 157 - 163)

Biotic stress and crop genetic diversity (pag 163 - 169)

Farmer management of crop genetic diversity to cope with environmental stress (pag 169 - 172)

Identifying where diversity is used to cope with environmental stress (pag172 - 180)

Genetic diversity, damage, and genetic vulnerability (pag 181 - 190)

13:00 Lunch break

14:00 Who are the managers of diversity? Characterizing the social, cultural and economic environments (Chapter 8) - *R. Nanyka/ P. De Santis ((Bioversity)*

Farmers' roles and the management of crop diversity (pag 191 - 199)

Social relationships and the distribution of diversity (pag 199 - 200)

15:00 Coffee break

15:15 Social capital, collective action and property rights (pag 202 -203)

Tool and methods for documenting and relating farmer characteristics to crop genetic diversity (pag 203 - 211)

16:00 Practicum – Who are the managers of diversity?

17:00 Presentations of participants

DAY 3

Module 1: Management of Agrobiodiversity

Friday, 20 September

09:00 **Measuring the values of on-farm diversity (Chapter 9) -** *D. Gauchan (Bioversity)*

Public and private values of diversity (pag 212 - 214)

Varietal choice and diversity maintenance (pag 215 - 220)

11:00 ***Coffee break***

11:15 Econometric models and value chain actors (pag 220 - 226)

Measuring non-market values of diversity (pag 226 - 231)

13:00 ***Lunch break***

14:00 **Policy and genetic diversity on-farm (Chapters 3, 10) -** *I.L. Noreiga (Bioversity)*

The development and evolution of national programs on plant genetic resources (pag 41 - 44)

The origins of an international commitments to plant genetic resources conservation (pag 45 - 46)

Policy debates on conservation- ABS (pag 46 - 57)

15:00 ***Coffee break***

15:15 **The use of genetic resources for plant breeding** (pag 56 - 62)

Policies and legal frameworks that have a negative impact on farmers' capacities to use diversity on-farm (pag 232 - 242)

Policy processes: Overview on concepts and methods (pag 242 - 249)

Developing policies that support farmers' role as generators, managers and conservers of crop diversity (pag 249 - 254)

17:00 **Presentations of participants**

DAY 4

Module 1: Management of Agrobiodiversity

Saturday, 21 September

Venue of the day: Rome Botanical Garden, Largo Cristina di Svezia, 23-24

09:00 **Genetic diversity and selection pressures at different social, spatial and temporal scales (Chapter 11) -** *D. Jarvis/ P Colangelo/ M. Turdieva (Bioversity)*

The crop cycle (pag 225 - 258)

Use of harvested materials and diversity of traditional varieties (pag 259 - 263)

Selection during crop production and seed management (pag 263 - 264)

Patterns of seed supply: The "Seed Systems" (pag 267 - 274)

Social, spatial and temporal dimensions of traditional varieties (pag 275 - 282)

11:00 ***Coffee break***

11:15 **Strategies for collaboration and intervention (Chapter 12)** - *P. De Santis (Bioversity)*

Institutional and partner diversity (pag 283 - 285)

Building trust and equitable collaboration (pag 286 - 290)

Actions that incorporate genetic, ecological, social and economic concerns in support of on-farm management of crop genetic diversity (pag 291 - 303)

Farmers benefit from the use and conservation of materials (pag 303 - 311)

12:30 **Traditional varieties and agricultural productivity (Chapter 13) -** *D. Jarvis (Bioversity)*

Socioeconomic, policy, environmental, biological and genetic dimensions (pag 313 - 320)

The future value of traditional varieties (pag 320 - 323)

Approaches to maintenance of traditional varieties (pag 323 325)

13:00 ***Lunch break***

14:00 **Rome Botanical Garden visit – hands on experience on biodiversity** - *F. Attorre (Sapienza)/ D. Jarvis (Bioversity)*

Methodology for the fomration of a germplasm bank for local crop varieties

Creation of an herbarium and storage of specimen samples

Visit of the vineyard Vigneto Italia, home to 155 autoctonos grapes varieties

18:00 ***Refreshments and discussion***

DAY 5

Module 2: Agrobiodiversity on the Ground

Monday, 23 September

9:00 **Agroecology** - *A. Bicksler (FAO AGPM)*

The principles of Agroecology

Agroecology as a science, practice, and social movement

11:00 ***Coffee break***

11:15 **Agroecology for resilience and climate change adaptation**

13:00 ***Lunch break***

14:00 **Climate-Smart Agriculture (CSA) -** *F. Matteoli/J. Schnetzer (FAO CBC)*

The CSA Approach

- Challenges and opportunities for agriculture in the face of climate change
- CSA concept and 5 step-process to CSA implementation
- Practices and production systems for CSA

Tools and methods for evidence-based decision making in CSA: brief introduction

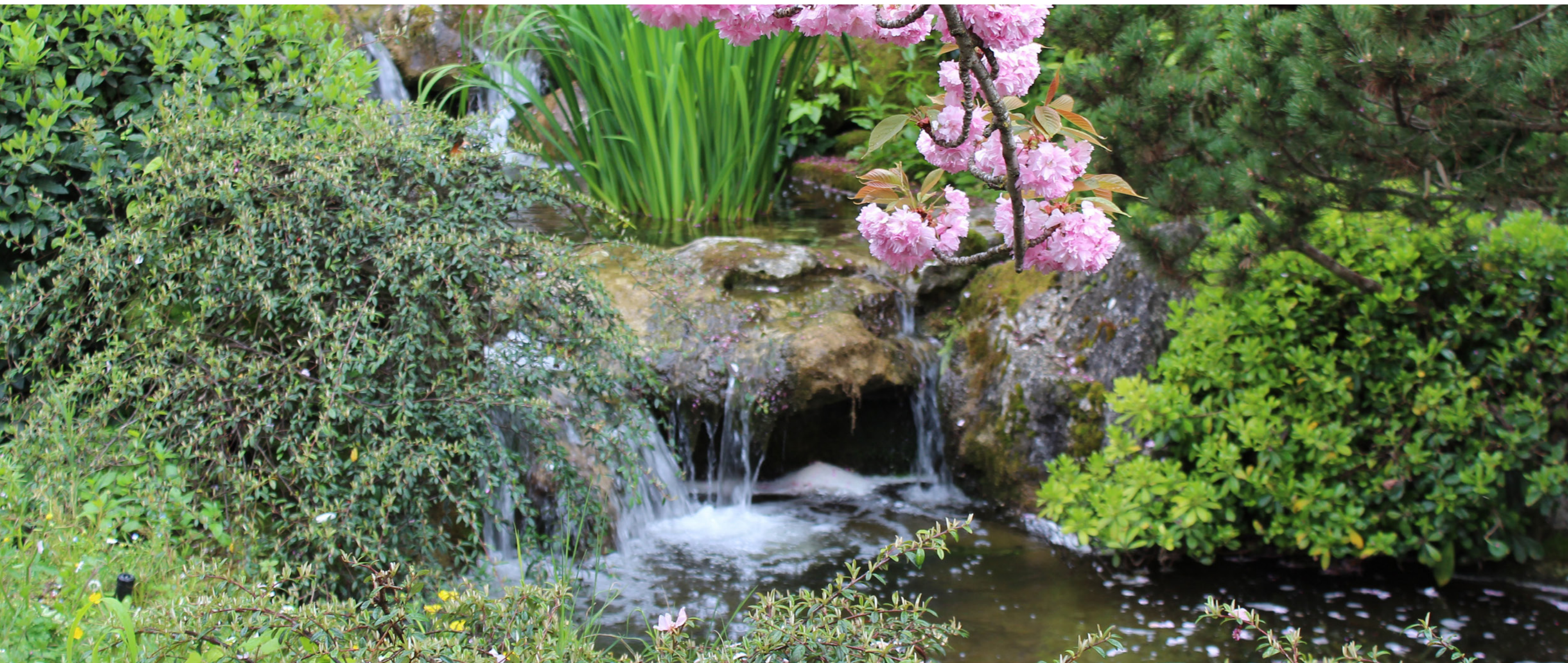
15:30 ***Coffee break***

15:45 **Tools and Methods for Evidence-based Decision Making in CSA: Examples & Exercise** - *R. Vuolo (FAO CBC)/L-S. Schiettecatte (FAO ESA)*

- Modelling System for Agricultural Impacts of Climate Change (MOSAICC)
- *Ex-Ante* Carbon Assessment Tool (EXACT)

16:45 **Mountain Partnership: mountain products' value chains** - *G. Grussu (FAO MP)*

The Mountain Partnership Products initiative



DAY 6

Module 3: Agrobiodiversity values as market drivers

Tuesday, 24 September

09:00 **Slow Food -** *F. Mattei/ E. Dughera (Slow Food)*

Agrobiodiversity as driver for rural development and the preservation of healthy ecosystems,

Externalities, ecosystem services and common goods

11:00 ***Coffee break***

11:15 **Promoting market access and generating sustainable demand paradigms**

Education and awareness raising

13:00 ***Lunch break***

14:00 **NaturaSì -** *F. Brescacin/ C. Murer (NaturaSì)*

Organic products in Italy and in the world: growing market, more responsible consumers

Effective and equitable farming techniques and distribution processes with low environmental impact

Economic and social wellbeing of producers and their communities

15:00 **How to build long lasting relationships of trust between producers, retailers and consumers. Marketing and distribution strategies for small mountain producers. Organic farming: new approaches and research**

15:45 ***Coffee break***

16:00 **The Lamon bean. A neglected crop at risk: problems and ideas for selection and guided co-evolution -** *T. Penco / P. Ermacora.*

17:00 **Open discussion**

DAY 7

Module 3: Agrobiodiversity values as market drivers

Wednesday, 25 September

10:00 **Field trip to Vallepietra Village**

Visit to the Slow Food presidium of Vallepietra, where a small consortium of farmers is starting to revive a traditional legume from the Simbrivio Valley, the “Ciavattone” bean.

Meeting point: FAO main gate, 09:00 hrs.

DAY 8

Module 3: Agrobiodiversity values as market drivers

Thursday, 26 September

09:00 **IFOAM -** *L. Luttikholt (IFOAM)*

Fundamental principles and definitions: Organic agriculture

Organic agriculture and its relation and contribution to other sustainable agriculture initiatives

11:00 ***Coffee break***

11:15 **Organic 3.0: Towards truly sustainable food and farming systems**

The organic movement and its support systems - Organic and SDGs

13:00 ***Lunch break***

13:45 **PGS (IFOAM)**

An overview/summary of current organic guarantee systems

Locally appropriate and smallholder-friendly alternatives - an overview

Participatory guarantee systems - principles and practice

16:15 **Open discussion**

16:30 **Certificate Award Ceremony**

Lecturers

Devra Jarvis

Principal Scientist at Bioversity International in Rome Italy, Adjunct Faculty at Washington State University, Adjunct Professor at the Institut Agronomique et Veterinaire Hassan II, Morocco and Coordinator of the Platform For Agrobiodiversity Research (PAR). Her work focuses on developing empirical evidence to assess and support the use of local crop genetic diversity to improve the production and resilience of small-holder farmers. She is the primary author of the textbook used as the scientific basis of this course.

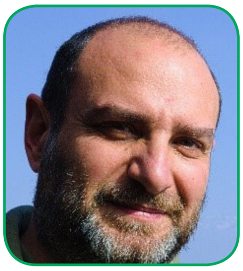
Toby Hodgkin

Research Advisor for the Platform for Agrobiodiversity Research and Honorary Research Fellow of Bioversity International. After working as a geneticist/plant breeder of vegetable crops, he joined the International Board for Plant Genetic Resources to work on the maintenance and use of plant crop genetic diversity. He has worked on in situ conservation of crops and their wild relatives since 1990, publishing extensively on different aspects of conservation and use.

Muhabbat Turdieva

Coordinator of the regional project 'In situ/on farm conservation and use of agrobiodiversity (horticultural crops and wild fruit species) in Central Asia', focused on sustainable use of local diversity of temperate fruit trees and their wild relatives in the center of their origin. Previously has worked as a Bioversity Forest Genetic Resources Scientist for Asia, Pacific and Oceania providing support to Central Asian and Transcaucasian Network on Plant Genetic Resources (CATCN-PGR).

Paolo Colangelo



Researcher at the Research Institute on Terrestrial Ecosystems of the National Research Council (CNR-IRET, Italy). His main research focus is on biodiversity, evolution and conservation combining molecular tools and ecological statistics. In the last decade he has collaborated with Bioversity International studying the relationship between agrobiodiversity and the resilience of agroecosystems to pests, disease and abiotic stress.

Massimo Reverberi

Associate Professor of Plant Pathology at Sapienza University. He participated in several European projects on the control of the biosynthesis of some mycotoxins in different foodstuffs and on the application of the integrated control against fungi responsible for post-harvest spoilages. He was coordinator in several Research Units of National Projects, and participated in five EU projects funded under FP7 and one LIFE Project 2018-2023.

Fabio Attorre

Associate Professor of Botany at Sapienza University. He is the scientific coordinator of several International Cooperation projects aimed at promoting the sustainable development of local communities and the conservation of biodiversity and natural resources. Areas of interventions included Mozambique, Eswatini, Zimbabwe, South Africa, Papua New Guinea, Albania, Yemen, Ecuador, Perù and the Dominican Republic.

Nadia Bergamini

Ecologist, at Bioversity International in the Productive and Resilient Farms, Forests and Landscapes Initiative. She has 8 years experience as an information officer in the Food and Agricultural Organization of the United Nations and nine years applied research, project management and extension experience in India, Nepal, China, the Philippines, Tunisia, Bolivia and Cuba. Areas of expertise include participatory and field research into sustainable production landscape management and socio-ecological resilience of agro-ecosystems.

Rose Nanyka

Conservation Biologist and Fellow of the African Women in Agricultural Research and Development Program. She works with Bioversity International in the Genetic Diversity, Productivity and Resilience Section, managing projects on using crop biodiversity for ecosystems production and resilience. She has 18 years of experience in multi-stakeholder processes involving NGOs, CBOs, and Government Institutions in sustainable natural resources management.

Devendra Gauchan

Agricultural Economist with a PhD from the University of Birmingham, specializing in economics of agricultural biodiversity conservation, currently is the National Project Manager at Bioversity International's Nepal office. He has worked in agricultural R&D sector in Nepal and abroad for over 20 years. Before joining Bioversity International, he was the Senior Scientist and Head of Socioeconomics & Agricultural Research Policy Division, at the Nepal Agricultural Research Council (NARC).

Isabel López Noreiga

Policy specialist on the Policies for Crop and Tree Diversity management research area at Bioversity International.

Her area of expertise is in biodiversity law and she has been involved in a number of research projects looking at the impacts of policies and legal frameworks on different actors' capacity to access, use, conserve and exchange natural resources, and particularly crop genetic resources.

Paola De Santis

She works for Bioversity International in the Genetic Diversity, Productivity and Resilience Section. She has been working on several national and international projects to improve productivity, enhance agro-ecosystems production and resilience and climate change adaptation by using crop genetic resources. Areas of expertise include development of partnerships at different levels, participatory approaches, and seed systems.

Abram J. Bicksler

Agricultural Officer with the Food and Agriculture Organization of the United Nations (FAO) based in Rome. He works with the Ecosystem Services and Agroecology Team within the Plant Production and Protection Division (AGP) on various initiatives related to the scaling-up of Agroecology, provision of ecosystem services, and is also the focal point for Pollinators within the division.

Lecturers

Federica Matteoli

Project Manager at FAO, has strong expertise in coordination of projects on climate change, food security and natural resources management at the global level and in developing countries. Federica has a PhD in Science and Management of Climate Change, a Degree in Law, a Master in International Services from the American University of Washington DC, and a Master in Project Management from Gestioni and Management in Rome.

Julian Schnetzer

Environment and Climate Specialist at FAO. He holds a BSc/MSc in geoecology from Potsdam University (Germany). Before joining FAO, he worked with the Swiss Federal Agricultural Research Institute on life cycle assessments of crops. In 2012, he joined FAO as a Natural Resources Officer and since then worked on different topics including crop modelling, climate change and climate-smart modeling agriculture.

Raffaella Vuolo

FAO, Climate and Environmental Division, studied atmospheric physics at University of Cagliari and Ecole Polytechnique of Paris and carried out research in various institutes in France and Italy, where her main work areas were climate and atmospheric transport modeling and agrometeorological field measurements. She now works on the use of weather and climate information for agriculture, supporting the development and implementation in developing countries of a climate impact assessment tool, MOSAICC.

Laure-Sophie Schiettecatte

FAO, EX-Ante Carbon balance Tool (EX-ACT) team coordinator, started at FAO as technical expert for the integration of blue carbon, aquaculture and fisheries into EX-ACT, holds a PhD in Marine Sciences from University of Liege. She is now coordinating the EX-ACT team activities, i.e. GHG appraisal of projects and policies, value chain analysis with on field mission, capacity building training, research and development of the EX-ACT suite of tools.

Giorgio Grussu

Project Coordinator for the Mountain Partnership Secretariat at the Food and Agriculture Organization of the United Nations (FAO) since 2012, he holds a PhD in Environmental Biology, a Master in Environmental Engineering, a Master in Environmental Policy, and a Graduate Certificate in Geographic Information Systems (GIS). Before joining FAO he worked as an advisor on environmental issues with the Italian Development Cooperation, and as a project manager with IUCN, UN Environment and NGOs in Morocco, Angola, North Macedonia, Kosovo, and Bosnia & Herzegovina.

Federico Mattei

Works in the Project Development and International Relations Office of Slow Food's Foundation for Biodiversity as a scientific and technical writer. He is responsible for developing project and seeking funding as well as technical or scientific revisions to reports, proposals and publications. Furthermore, leads several Slow Food projects on sustainable development, agriculture and sustainable tourism. He holds a Master in Human Ecology and a Master in Food Security.

Emanuele Dughera

Works for the Slow Food Foundation for Biodiversity as coordinator of the Africa and Middle East Office. He is responsible for managing the office team and being the spokesperson of the group. Furthermore, manages Slow Food actions, grassroot projects, food and educational activities, in the Southern African countries as well as Portuguese speaking countries in the African continent.

Fabio Brescacin

President of EcorNaturaSì S.p.A. In 1979, he graduated in Agriculture from the University of Padua, then he attended the Emerson College in England. Back in Italy he opened Ariele, one of the first organic food stores in Italy. In 1987 he was among the founders of Gea, a distribution company that then became EcorNaturasì S.p.A., now the leading distributor of organic and biodynamic products in Italy. He has been the president of the company since the beginning.

Carlo Murer

Specialized in Sustainable Tropical Forestry at Copenhagen University. Currently working as buyer of organic raw material for EcorNaturaSì Spa. He keeps the commercial relation with the 200 farms supplying raw materials (cereals, seeds and pulses) for the EcorNaturaSì's monitored production chains.
He is implementing a Participatory Guarantee System PGS in Italy, among the farms working with EcorNaturaSì.

Tiziana Penco

President of the "Consorzio per la Tutela del Fagiolo di Lamon IGP", the farmers' association for the protection of Lamon bean, since 2006. She works in the promotion of mountain agriculture with special focus on neglected crops and disadvantaged communities. Her efforts toward the support of small, local producers of the Lamon bean are in conjunction with Italian regional and national institutions working on rural areas and environmental issues.

Paolo Ermacora

Researcher at the University of Udine. His main research focus is plant pathology, plant resistance and tolerance to viruses. He holds several courses in the Department of agri-food, environmental and animal sciences and collaborates with the "Consorzio per la Tutela del Fagiolo di Lamon IGP".

Louise Luttikholt

Executive Director of IFOAM – Organics International. Before, she founded and directed HELVETAS Germany and functioned as a Senior Advisor on Sustainable Agriculture to HELVETAS Swiss Intercooperation, specializing in Nutrition Sensitive Agriculture. She has worked as Director of Strategy and Policy for Fairtrade International and has served on several high-level advisory positions within the fair trade movement. Since 1995 Louise has been active in the organic agriculture movement, including key positions leading strategy and policy for IFOAM.

Field trip

Vallepietra

Vallepietra is a small medieval village, located 100 km east of Rome. It lies in the heart of the Monti Simbruini Regional Park at 800 metres above sea level, in a valley that has a unique microclimate due to the presence of freshwater springs. The springs flow into a small river that and feeds the Simbrivio aqueduct, which is directly connected to Rome.

The ciavattone bean

The abundant water and altitude of Vallepietra have allowed a specific variety of bean to adapt to the local climate conditions. The Vallepietra bean, “Ciavattone”, has been growing there since the 16th century: the cultivated bean fields are located on ancient terraces that start from the lowest part of the valley and reach up to the rocky slopes. The bean has a large, pearly-white seed and a very thin skin due to the chalky soil. No weed killers or chemical fertilizers are used, as they can pollute the springs. The beans are cultivated in April and harvested in September: the seeds for the following sowing are selected from the flowers that develop first, while the rest are sold. The traditional recipes are simple: plain with extra-virgin olive oil and onions, in soups and salads, or with a sauce made with pig skin sausages.

Traditional farming

When the bean was central to the local economy it was cultivated throughout the valley in small terraces. However, in the past few decades many of the terraces have been overgown with grass, and both bean cultivation and the village of Vallepietra have been gradually abandoned. A few years ago, a small consortium of farmers started to revive all traditional legumes from the Simbrivio Valley, while Slow Food has established a Presidium in Vallepietra to protect quality production from the risk of extinction, as well as recover the traditional processing methods and safeguard its native breeds. The ciavattone bean is now being promoted in an attempt to bring new life back to the valley.

Field trip logistics

Participants should meet at 09:00 at the main gate of FAO HQ on Wednesday 25 September. The bus trip to Vallepietra will take approximately two hours. The return is scheduled at 19:00, but could vary depending on traffic/contingencies. Please wear comfortable shoes and bring with you some water for the day and sun/rain protection. Lunch is included in the excursion.

GROW

GUIDANCE NOTES

Agrobiodiversity in a Changing Climate

MODULE 1. MANAGEMENT OF AGROBIODIVERSITY

Lecturers: D. Jarvis, T. Hodgkin, M. Turdieva, P. Colangelo, M. Reverberi, F. Attorre, N. Bergamini, R. Nanyka, D. Gauchan and I. Lopez Noriega.

1.1 Crop genetic diversity, domestication and traditional varieties
1.2 Diversity, its evolution in crop populations and its measurement
1.3 Gathering data using participatory approaches
1.4 Abiotic components of agricultural ecosystems
1.5 Diversity in, and adaptation to, adverse environments on-farm
1.6 The managers of diversity: social, cultural and economic environments
1.7 Measuring value of on-farm diversity
1.8 Policy and genetic diversity on-farm
1.9 Strategies for collaboration and intervention

MODULE 2. AGROBIODIVERSITY ON THE GROUND

Lecturers: A. Bicksler, F. Matteoli, J. Schnetzer, R. Vuolo, L-S. Schiettecatte, G. Grussu

2.1 Agroecology
2.2 Climate-Smart Agriculture (CSA)
2.3 Mountain Partnership: mountain products' value chains

MODULE 3. AGROBIODIVERSITY VALUES AS MARKET DRIVERS

Lecturers: F. Mattei, E. Dughera, F. Brescacin, C. Murer, T. Penco, P. Ermacora, L. Luttikholt

3.1 Slow Food and Sustainable Food Systems
3.2 Promoting market access and generating sustainable demand paradigms
3.3 The NaturaSì model
3.4 How to build long lasting relationships of trust between producers, retailers and consumers
3.5 The Lamon bean
3.6 IFOAM and Organic Agriculture
3.7 Participatory Guarantee systems (PGS)

REFERENCES

The course is based on Yale University textbook *Crop Genetic Diversity in the Field and on the Farm: Principles and Applications in Research Practices* (included as course material)

Module 1: Management of Agrobiodiversity

1.1 Crop genetic diversity, domestication and traditional varieties (Chapters 1,2,3)

i. The increase of crop genetic diversity and the introduction of traditional varieties in farming systems can improve resilience to heterogeneous and variable environments, protection against local pests and adaptation to climate change.

ii. Domestication is the selective process by which human use of plant and animal species leads to morphological and physiological changes of wild ancestors (pp. 16). Domestication and the introduction of novel variations help the maintenance of diversity within the farming systems.

iii. Major Crops and Neglected Crops: Traditionally, agricultural research and development has focused on major crops, neglecting many other local ones that are important to human well-being and ecosystem resilience. Three crops (rice, maize and wheat) provide 50% of the world's calorie intake, and 15 crops supply 90% of our total food intake. Neglected crops are fundamental for human health because they reduce the risk of dependence on the few major crops, adapt more to changing environments and can have high nutritional value.

iv. Centres of origins of crop plants (i.e. the original centres for the domestication of plants) are often associated with ancient civilizations.

v. Centres of diversity are regions of vast genetic diversity of crop plants and are important for on-farm conservation, for potentially useful crop genetic variation and to avoid genetic erosion.

vi. Due to their isolation and variable climatic conditions over relatively short distances, mountainous areas often host a rich variety of ecological systems and genetic diversity. However, they are highly vulnerable to human and natural ecological imbalance and the most sensitive areas to all climatic changes.

vii. Main international policy debates on biodiversity conservation:

- The United Nations Convention on Biological Diversity (UN CBD);
- The FAO Commission on Genetic Resources for Food and Agriculture (CGRFA), which monitors the Global System on Plant Genetic Resources for Food and Agriculture;
- The FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

1.2 Diversity, its evolution in crop populations and its measurement (Chapter 4,5)

i. Genetic diversity is the amount of genetic variability among individuals of a variety, population or species.

ii. Crop, species, variety and population definition:

- Crop: a cultivated plant that is grown and harvested for profit or subsistence;
- Species: a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding;
- Variety: a plant or group of plants selected for desirable characteristics and maintained in cultivation (the term can also be used in the sense of botanical variety - a distinct group of wild plants within a species);
- Population: a group of plants of one crop or species that are growing together in a specified locality.

iii. Population structure is based on: reproductive characteristics, population size, maturity, perenniality and structure and minimum viable populations.

iv. Population genetic structure can be described in terms of: richness (how many different kinds irrespective of their frequency), evenness (how similar are the frequencies of different variants) and divergence.

v. Evolution in crop varieties and populations depends on: Selection, Mutation, Recombination and Migration.

vi. Important aspects of reproductive biology include the breeding (mating) systems, pollination mechanisms and seed dispersal.

vii. Variety structure and names, consistency of variety names, agromorphology-characterization and evaluation are important to the full description of the extent and distribution of diversity

1.3 Gathering data using participatory approaches (Chapter 5, pp. 108 - 118)

i. Iterative participatory approaches of gathering data are necessary to understand extent, distribution and structure of genetic diversity in traditional varieties and their management.

ii. Different participatory approaches for gathering data are:

- Focus group discussions for farmer identification and characterization of varieties through names and identities commonly defined;
- Collaborative mapping of the spatial distribution of varieties among and within plots on-farm.

iii. An investigation of on farm diversity should include answering questions on:

- The varietal structure of the crop in the area and how is it maintained;
- The distribution of genetic diversity between and within traditional varieties;
- The geographic distribution of the observed diversity.

1.4 Abiotic components of agricultural ecosystem (Chapter 6)

i. The abiotic components of agricultural ecosystems are: climatic factors, soils, environmental disturbance, Carbon dioxide levels and climate change.

ii. The biotic components of agricultural ecosystems are: Pathogens, Pests, Biological control agents, Weeds, Soil organisms, Pollinators.

iii. The abiotic stresses that affect crop genetic diversity are: drought stress, cold stress, heat stress, excess of water, elevated $CO2$ and adverse edaphic conditions like salinity, acidity, low nutrient content, toxicity.

iv. The biotic stresses that affect crop genetic diversity are: pathogens and arthropod pests.

1.5 Diversity in, and adaptation to, adverse environments on-farm (Chapter 7)

i. Farm management of crop genetic diversity is essential in order to minimize crop loss and support use of local varieties that can adapt to climate change and therefore reduce the risks related to dependency on limited cash crops. Smallholder farmers already know how to use crop genetic diversity and apply specific agronomic practices to manage crops.

ii. Diversity is used to cope with environmental stress:

- Fluctuation in climatic variables and climate change;
- Changes in soil conditions;
- Major random catastrophes (even if destruction is not amenable to diversity mitigation, replacement from an ex situ source is key, if seeds are as similar as possible to the destroyed varieties);
- Changes in Pathotype, Aggressiveness and Virulence (the pathogens evolve and biodiversity allow plants to adapt to these changes and resist);
- Mechanisms that affect disease incidence (distance between plants, plants acting as barriers, avirulent spores exposition to prevent virulent spores attacks, competition between pathogens races).

1.6 The managers of diversity: the social, cultural and economic environments (Chapter 8)

i. Farmers' management practices can influence patterns of genetic diversity within and among local crop populations.

ii. Farmers, as custodians and managers of diversity, are characterized by age or generation, gender, kinship, wealth and income status, education, social status, ethnicity, language.

iii. Socially, culturally and economically determined roles, collective action and property rights affect the distribution of crop genetic diversity.

iv. Tools and methods for documenting farmer management of crop genetic diversity are:

- Qualitative social research methods (interviews, oral histories, participant observation, mapping and diagramming);
- Quantitative social research methods.

1.7 Measuring value of on-farm diversity (Chapter 9)

i. Intensification, commercialization and market development have narrowed genetic diversity on farm because farmers prefer to grow modern uniform varieties that are easy to plant, to harvest and to thresh using modern tools.

ii. Crop genetic resources are "impure public goods": they have both private and public economic attributes. The private value is the harvest the farmer enjoys (immediate food and income needs). The main public value is the germplasm (unique genetic traits) from which future generation of farmers and consumers will benefit. There are also other public values - e.g. reduction on risk of epidemics as in vaccination and human populations.

iii. Crop genetic diversity is economically undervalued and the public good nature of most crop diversity is not considered. This happens because of:

- Failure of market to recognize the real crop gene pool value;
- Internalizing external costs;
- Policy and institutional failure to conserve and utilize crop gene pools appropriately;
- Technical failure: side effects of certain technical intervention or lack of technical solutions to effectively conserve and utilize crop gene pools.

iv. From an economic perspective (i.e. choices about the allocation of resources available) on-farm diversity relies on the Total Economic Value:

- Use value (direct use, indirect use, option value);
- Non-use value (bequest value, existence value, option value).

v. Methods to valuation of non-market values: Revealed Preference method (Indirect) and the Stated Preference method (Direct). Value chain analysis and people's behaviour analysis in markets (willingness to pay) help to understand the value of associated non-market goods.

1.8 Policy and genetic diversity on-farm (Chapter 3,10,11)

i. There are policies and legal frameworks that have a negative impact on farmer's capacities to use diversity on-farm:

- Policy instruments ensuring that technologies respond to the purpose of agriculture modernization: seed laws;
- Policy instruments supporting crop improvement for the development of modern varieties, imposing limitations on using, saving and exchanging seed: intellectual property rights (such as copyrights and

patents, which do not provide tools to recognize or compensate farmers whose traditional varieties or ancestral knowledge become the source of modern varieties developed by others);

- Policy instruments supporting farmers to adopt modern varieties of crops valued in national and international markets: subsidies for specific standard products.

ii. Policy processes for agrobiodiversity need to:

- Identifying areas for policy;
- Understanding the context in which the policy process takes place;
- Identifying stakeholders to be involved in policy evaluation and formulation;
- Putting in place participatory tools for policy research and development;

1.9 Strategies for collaboration and intervention (Chapter 12)

i. The use and conservation of crop genetic diversity in agricultural production requires:

- Resources and technical expertise;
- Partnership among individuals and institutions for concrete actions in order to balance the different interests to address the needs of all the parties involved;

ii. Institutional diversity is necessary and stakeholders range from:

- Farmers and local communities (Farmers' Organizations, Community-Based Organizations, Non-Governmental Organizations);
- Ecologists or ecosystem health workers;
- Conservationists and breeders;
- National governments;
- Private sector;
- Consumers.

iii. Categories of actions that promote sustainable use of crop genetic diversity:

- Improve availability of materials;
- Improve information and availability of information;
- Improving traditional variety materials and their management;
- Improve processing;
- Market creation and market promotion;
- Build partnerships and trust;
- Change norms;
- Alternatives and modification to seed certification systems;
- Promote ecological land management practices;
- Payment schemes for ecosystem services.

iv. Building trust and equitable collaboration is possible through:

- Community biodiversity management (a participatory approach to empower farmers, and local institutions for managing agricultural biodiversity, by enhancing the capacity of communities to analyse livelihood, problems and to implement solutions);
- Diversity field fora (co-research and co-learning activities / tasks in the field, with periodic measurements and observations, meetings between partners);

- Community Biodiversity Registry (a record of local knowledge for the use of present and future generations of village community people);
- Seed banks (mainly informal institutions, locally governed and managed, whose core function is to preserve seeds for local use);
- Seed/Diversity fairs;
- Geographical indications systems and labels;
- Participatory plant breeding.

v. Farmers benefits from the use and conservation of biodiversity materials could be:

- Reduced risk of harvest loss and diseases;
- Improved processing;
- "Diversity market" creation and promotion;
- Land-use regulations and incentives;
- The adaptation of payments for ecosystem services for the conservation of crop diversity on-farm.

Module 2. Agrobiodiversity on the Ground

2.1 Agroecology

i. A transition to sustainable food and agriculture systems that ensure food security and nutrition for all, provide social and economic equity, and conserve biodiversity and the ecosystem services on which agriculture depends is urgently needed.

ii. Agroecology is an integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems that squarely puts people at the centre of food systems.

iii. It seeks to optimize the interactions between plants, animals, humans, and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system.

iv. It is based on bottom-up and territorial processes, helping to deliver contextualized solutions to local problems that are based on the co-creation of knowledge combining science with other forms of traditional, practical and local knowledge.

v. In guiding countries to transform their food and agricultural systems, to mainstream sustainable agriculture on a large scale, and to achieve Zero Hunger and multiple other SDGs, FAO created the 10 Elements of Agroecology as an analytical tool to help operationalize. The 10 Elements are interlinked and interdependent and include:

- Diversity; synergies; efficiency; resilience; recycling; and co-creation and sharing of knowledge (these elements describe common characteristics of agroecological systems, foundational practices, and innovative approaches);
- Human and social values; and culture and food traditions (context features);
- Responsible governance; circular and solidarity economy (enabling environment).

2.2 Climate-Smart Agriculture (CSA)

i. Climate change impacts agriculture, food systems and food security in various ways. At the same time, agriculture and food systems are major contributors to global greenhouse gas emissions and drivers of climate change.

ii. Climate-Smart Agriculture (CSA) is an approach developed to address food security, climate change adaptation and mitigation in agriculture in an integrated way.

iii. The main objectives of CSA, considered the CSA pillars are:

- Sustainably increase agricultural productivity and incomes;
- Adapt and build resilience of people and food systems to climate change;
- Reduce and/or eliminate greenhouse gas emissions, where possible.

iv. CSA is not an agricultural system per se or a set of practices that can be universally applied. It serves to identify and implement locally adapted, suitable and viable food production systems, which contribute as much as possible to all three CSA pillars, maximize the synergies and minimize the trade-offs between them.

v. The CSA's implementation process consist of five main steps related to: the evidence base, enabling policy environment, institutional capacities, financing options, and field implementation.

2.3 Mountain Partnership and mountain products' value chains

i. Mountains represent 27 percent of the earth's land surface and are home to 15 percent of the global population, or about 1 billion people. Agriculture (including livestock, forestry and fishery) is often the backbone of mountain economies, providing assistance to much of this population. Supporting mountain agriculture is important for the Mountain Partnership for this reason, among others:

- From a global perspective, agriculture is one of the major drivers of climate change (responsible for the emission of 30-50 percent of global greenhouse gases); however, mountain agriculture is small scale and base on family farming. In fact, mountain farmers are often considered custodians of farming practices and sustainable soil management approaches, which these peoples have developed over centuries;
- Mountainous areas often host a rich variety of ecological systems and genetic diversity due to their geographic isolation and variable climatic conditions over relatively short distances. For example, 6 of the 20 most important food crops originated in mountains (potatoes, maize, barley, sorghum, apples and tomatoes);
- Mountain agriculture is particularly affected by climate change because it is primarily rain-fed with little storage or irrigation capacity. Changes in precipitation, temperature, the length of the growing season, the timing of extreme or critical threshold events, and atmospheric CO_2 concentrations are among the most impactful factors.
- It is important to note that though climate change may have some positive effects in some mountain regions in the short term, research suggests that the overall, long-term effects are generally negative. Decreasing river flows as a result of decrease of glaciers is expected to decrease water resources for irrigation, while increasing the risk of extreme weather events - including floods and droughts. Such events are expected to negatively affect crop yields and reduce areas suitable for cultivation. In some regions where increased precipitation and warmer temperatures can have a positive effect on yields, negative effects may still be present, and such factors may also facilitate the spread of new pests;
- Mountain farmers' ability to adapt to the effects of climate change is highly challenged. Cultivation in mountains is time-consuming and labour intensive, and small-scale mountain businesses are often disadvantaged compared to lowland businesses due to: limited availability of suitable land, reduced soil fer-

tility, harsh terrains, smaller and more fragmented plots, poor infrastructure, and lack of mechanization, investments, financial resources, agricultural extension services and training opportunities. Distance from markets, long value chains and lack of means to reach markets put limits on mountain producers. Mountain food products, generally associated with high quality by consumers, have to compete in the market with the lower prices and larger volumes of lowland products, and often end up being sold at a price that is not fair to the producers. As a consequence, mountain farmers are pushed to abandon the production of their traditional products and shift to market crops, or to abandon the land altogether and search for better jobs in urban areas. A common result of male outmigration in many rural mountain regions, such as the Tropical Andes and the Hindu Kush Himalaya, is that responsibility for agriculture falls to the women. Those left behind often face more obstacles than men in order to succeed in agricultural endeavours, including reduced access to finances and land, and lack of decision-making power and often have to confer their products to middlemen.

ii. The strategy of the Mountain Partnership Products (MPP) initiative is to support mountain farmers in benefitting fully from the potential of mountain products. The initiative aims to do so by tapping into niche markets which are increasingly popular as global demand rises for products that are sustainable, natural, authentic, healthy and fair trade. Improving the livelihoods of rural mountain communities by supporting mountain agriculture will build these communities' resilience and capacity to adapt to the effects of climate change.

iii. The MPP is a certification and labelling scheme based on environmentally and ethically sound value chain approaches. Each product marketed under the MPP initiative carries a narrative label that tells the story of the product and its producer, giving mountain peoples a voice in the marketplace. The label forms a relationship of trust between producers and consumers by providing reliable information and justification for paying a small premium price for a high-quality product. The MPP label is available free of charge for smallholder mountain producers, following a review of their products and production methods. With this simple communication tool, farmers can increase their competitiveness in the marketplace, thus contributing to mountain people's food security, nutrition, economic development and sustainable natural resource management.

iv. In addition to the narrative labelling scheme, the MPP initiative has created the first-ever international network of Participatory Guarantee Systems (PGS) specifically designed for smallholder farmers in mountain regions. PGS are generally defined as low-cost certification schemes for organic products, suitable for smallholder farmers selling at local/national markets. PGS are locally-focused quality assurance systems - alternative or complementary to third-party certification schemes - that certify producers based on active participation of farmers, consumers and other relevant stakeholders. With the publication of the "Ranikhet Declaration for a Global Mountain PGS Network" in 2019, the MPP initiative started a transition towards a PGS that will certify participants as ethical, fair and organic. The PGS and the declaration can be seen, respectively, as a technical tool and a political tool: tools that mountain producers are using to chisel their way into new markets.

v. The MPP initiative has thus far benefited more than 10 000 small farmers (60 percent of whom are women) in eight countries, which has increased sales and selling prices by up to 49 and 25 percent, respectively.

Module 3. Agrobiodiversity values as market drivers

3.1 Slow Food and sustainable food systems

i. Sustainability is the characteristic of something that is ecologically sound, economically viable, socially fair and culturally acceptable. It is linked to the idea of time, of lasting. An action, production or a system that relies on certain resources (human, economic or natural) will last for as long as it is designed to and for as long as it is able to replenish the resources it uses.

ii. Externalities and ecosystem services definition:

- In economics, an externality is the cost or benefit that affects a party who did not choose to incur that cost or benefit. Externalities often occur when a product or service's price equilibrium cannot reflect the true costs and benefits of that product or service.
- Ecosystem services are the many and varied benefits that humans freely gain from the natural environment and from properly-functioning ecosystems.

iii. The food system is in a profound crisis due to a variety of reasons:

- Most production paradigms are denoted by the production of significant externalities which are not rewarded through market mechanisms.
- Present production paradigms cause the loss of ecosystems services, biodiversity and rural livelihoods.

iv. The world's biodiversity is currently in a critical condition, seriously threatened by intensive farming and other unsustainable methods of food production.

- According to FAO estimates, 75% of agricultural crop varieties have disappeared and ¾ of the world's food comes from just 12 plant and 5 animal species. In the US, for instance, 7,000 apple varieties and 2,500 pear varieties were once grown, but today just 2 pear varieties account for 96% of the entire market. One third of native cattle, sheep and pig breeds are now extinct or on the verge of extinction.

v. Smallholder farmers and fisher folk around the globe act as guardians of territories, ecosystem services and biodiversity. However, they are increasingly under social and economic pressure to either leave their homes seeking employment in urban areas or to transform their production in to intensive agricultural paradigms. This trend is a serious threat to both rural livelihoods and environmental resilience.

vi. Slow Food's overall strategy is based on:

- The need of a paradigm shift away from the prevailing industrial food system to diversified agroecological food systems based on the right to food.
- The combination of grassroots actions and field work that are most effective at local level (e.g. promotion of agroecological farming, closer links between producers and citizens and awareness raising activities) together with actions effective at the global level (e.g. bringing the experience and vision of our network in international policy arenas, rolling up public engagement and actions, international synergies between different initiatives etc.), in the Global North as well as in the Global South, with an integrated holistic approach.

vii. Biodiversity conservation can only be effective if public awareness and concern are substantially heightened and if policy makers have access to reliable information. The impact of investments in the agricultural sector depends significantly on the kind of interventions carried out and on the type of food system that is promoted.

3.2 Promoting market access and generating sustainable demand paradigms

i. A value chain is the full range of activities (including design, production, marketing and distribution) that economic actors conduct to bring a product or service from conception to delivery.

ii. Slow Food International works for the improvement of short, transparent, direct value chains between consumers and producers, where:

- Producers have an incentive towards developing or conserving quality based production models that are then rewarded willingly, through a price premium, by consumers.
- Conversely, consumers can access culturally adequate, safe, nutritious food at affordable prices.

iii. The so called "consumer" is the real key to change. Consumers hold a lot of power. With increased awareness of the value of their choices, they are in a position to redirect the market and the production by creating demand for the right products.

iv. Food shopping is a political act. A responsible consumer who chooses to support a given production system is a co-producer. When we choose our food, we can go beyond a passive role and take an active interest in those who produce our food, how they produce it and the problems they face in doing so, increasing the understanding of what a healthier, tastier and more responsible diet means in different regions.

3.3 The NaturaSì model

i. EcorNaturaSì is the lead Italian company in the production, distribution and sale of organic and biodynamic products. Its commitment is to support the production of farming companies that embrace its corporate values: healthy nutrition, care of soils, and respect for the people -be them suppliers, employees, contractors, consumers or customers.

ii. The private sector involvement in the care of soil and in the promotion of a social community at large is the condition to create fair and respectful relationships between individuals, to ensure the health of the environment and the health of people.

iii. All we eat originally comes from a farm. Farms are the beating heart of EcorNaturaSì's ecosystem because the quality of what we eat depends on the way this food has been cultivated or raised.

iv. The type of agriculture implemented in the farms, besides the quality of food, has direct impacts on the environment and on the people who produce that food. The role of EcorNaturaSì is to convey this message to the people who visit the shops, making them aware of the consequence of their purchasing choices: the way we choose what to buy has a direct impact on the environment where food is produced, on the people who produced and on the quality of the food we eat.

3.4 How to build long lasting relationships of trust between producers, retailers and consumers

i. A relationship cannot be built just through advertisements or through storytelling. People look for concrete and direct experiences, people look for information and knowledge, for human relationships built on trust.

ii. EcorNaturaSì's objective is to transform the linear conception of supply chain, made by producers, warehouses, processors, distributors, shops, and consumers in a network of crossed interaction and reciprocal understanding. We want to re-establish the relationship between farmers and those who eat their products. Only through this approach we will be able to build that feeling of community based on respect for the production of quality and healthy food.

3.5 The Lamon bean

i. The Lamon bean a neglected crop at risk of extinction, which was granted a Protected Geographical Indication (IGP) label in 1996. The bean has faced recurrent epidemic virus attacks, which cause severe production losses. The viruses cannot be fought directly and the Lamon bean lacks ecotypes with genetic resistance.

ii. The producers' association (Consorzio per la Tutela del Fagiolo di Lamon), in collaboration with the University of U dine, developed a project to progressively select plants that are more resistant and tolerant to pathogens, while maintaining and respecting the crop's typicality, its historic biodiversity and farmers' incomes.

3.6 IFOAM and Organic Agriculture

i. Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. (IFOAM definition: 2008, GA Vignola)

ii. The definition of Organic Agriculture is underpinned by the 4 principles: Health, Ecology, Fairness and Care, and they are very well aligned with "like-minded" approaches like agroecology, permaculture, natural farming, biodynamic agriculture, etc.

iii. The concepts of agroecology and organic agriculture are deeply linked. Organic agriculture is to be seen as a well-defined subset of the broader concept of agroecology. The two concepts are not in opposition, but rather two complementary parts of a greater whole.

iv. Several arrangements concerning organic agriculture are in place world-wide: bilateral arrangements, unilateral arrangements and countries recognitions.

v. Organic development has led to a significant tightening of the standards in some areas and has improved consistency of application. However, it has also caused a dramatic rise in the impersonality and bureaucracy of organic standards and certifications, and it has helped to disempower the organic movement in this crucial area.

vi. While organic agriculture goes well beyond markets, the marketplace is still an important aspect and adds value, supports livelihoods, health and wellness of communities.

3.7 Participatory Guarantee Systems (PGS)

i. "Participatory Guarantee Systems (PGS) are locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange." (IFOAM's Definition)

ii. PGS are affordable and appropriate systems for emerging and smallholder farmers and marginalized communities. They offer a valid alternative to Third Party Certifications (TPC) at a reasonable cost for the farmer, even if they are not a suitable solution everywhere, due to constrains related to time, capacities and organization.

iii. Common PGS elements are

- Shared vision: While PGS programs may vary in the level of actual participation, they thrive because of the active awareness of why, how, and WHO is being served.
- Participation: Participatory certification is based on a methodology presupposing intense involvement by those interested in the production and consumption of these products. The credibility of the quality is a consequence of participation.
- Transparency: All stakeholders, including farmers, must be aware of exactly how the guarantee mechanism generally works and how decisions are made. There must be written documents available about the PGS and the documents are available to all interested parties.

- Learning process: PGSs provide more than a certificate, they also aim to provide the tools and mechanisms for supporting sustainable community and organic development, where the livelihoods and status of farmers can be enhanced. It is important that the process of certification contributes to the construction of knowledge.
- Horizontality: Horizontality means sharing of power. The verification of the organic quality of a product or process is not concentrated in the hands of few. All involved on the process of participatory certification have the same level of responsibility and capacity to establish the organic quality of a product or process.
- Trust - enabled by the other elements: Farmers can be trusted and the organic certification system should be an expression of this trust. A variety of culturally specific (local) quantitative and qualitative mechanisms for demonstrating and measuring organic integrity are recognized and celebrated.

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