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Management of Natural and Environmental Resources for Sustainable Agricultural Development

Proceedings of a Workshop

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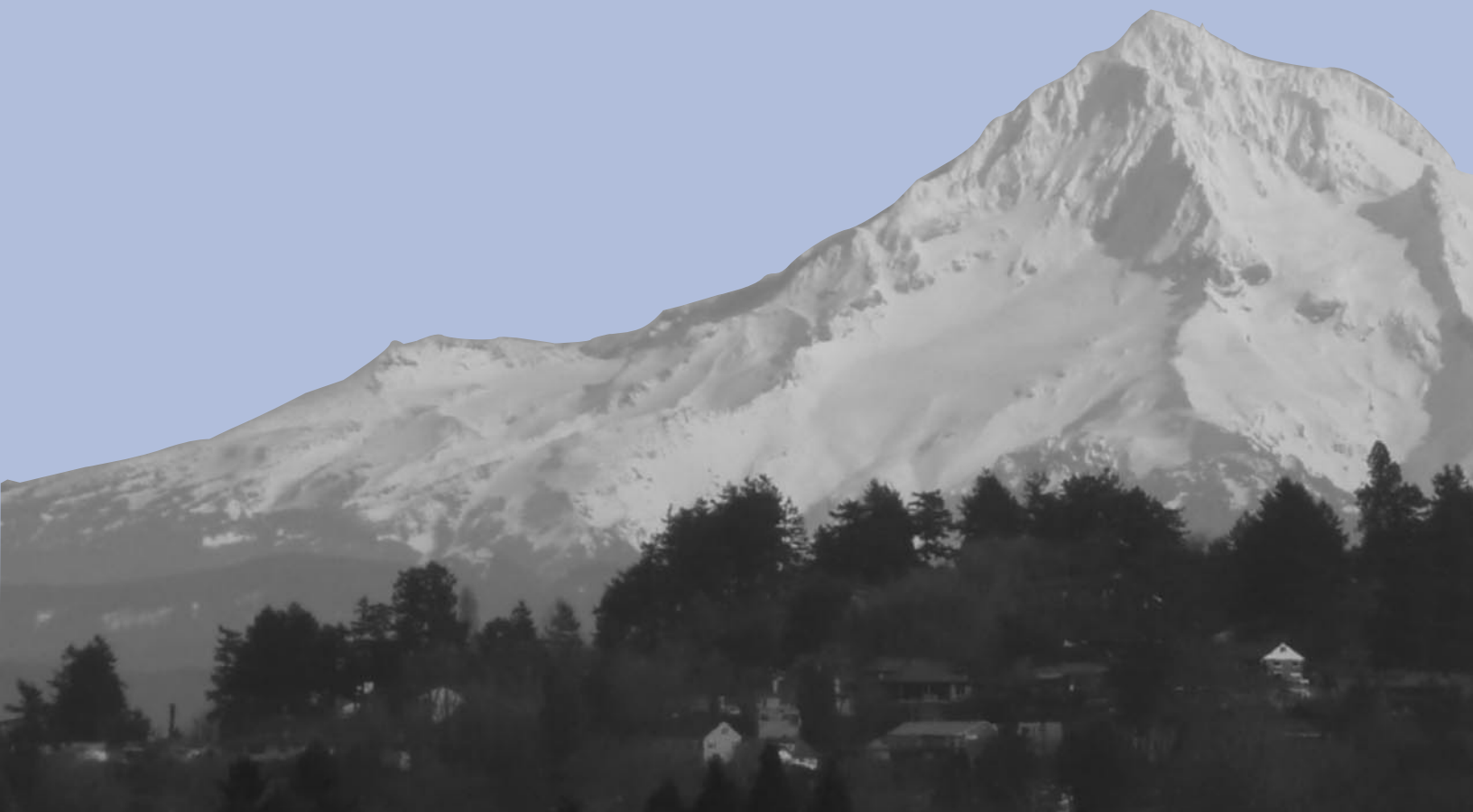
Portland, Oregon



Management of Natural and Environmental Resources for Sustainable Agricultural Development

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Editors

Robert Stefanski and Philip Pasteris

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Table of Contents

Table of Contents (con't) **Page**

Land Degradation and Natural Disaster Reduction

Fire Weather Agrometeorology

Workshop Conclusions and Recommendations

Foreword

Over the past two decades, there has been an increasing awareness of the potential damages that climate change, air and water pollution and inadequate natural resources management could induce upon human health, natural ecosystems and the economy. To address these concerns, considerable emphasis has been placed on sustainable development by many countries and international organizations. Accordingly, sustainable agricultural development has become a major issue of the 21st century.

Agriculture is today a key industry worldwide, since it is estimated that one out of nearly every three people is engaged in farming and agriculture, which provide practically all of the cereals, vegetables, meat, fish and forestry products that we depend upon. Consequently, farmers must make a most efficient use of all natural resources, in particular of soil, water and air, in generating these vital products.

With the accelerating population growth, diminishing arable land surface - especially in developing countries - , declining non-renewable energy supplies and an increasing awareness of potential environmental degradation, there is now much greater demand for sustainable management in the agricultural sectors of the world's economies. Although food production in the developing world is expected to increase at a faster rate than in developed countries, cereal production will not be able to keep pace with demand. Cereal imports by developing countries are therefore expected to double in order to bridge the gap between food production and demand. Irrigated areas are also projected to grow at a slower rate during the next few decades than in the previous ones, and soil degradation is an escalating problem, especially in the developing world. The concept of sustainable agriculture therefore now encompasses ecological, economic and social issues for which weather and climate are key factors.

In particular, agricultural production is highly dependent upon weather, climate, and water availability, and sustainable agricultural development needs to incorporate weather and climate information in order to be most effective. Some examples of this fact include the use of climate information to select the most appropriate crops for a given region, thus contributing to sustainability; use of long-term climate information to ensure water availability for agricultural and other users of water management projects; use of climate information to asses the risk of land degradation as a possible consequence of certain land management practices; use of climate forecasts to determine the optimal distribution of crops to be grown and rangeland management practices to be implemented over the next growing season; and use of weather and climate forecasts to estimate fire risks in woodland management.

Weather and climate information can also be used to advantage in assessing the risk of agricultural and land practices that might somehow impact upon the environment. Recent studies have shown that runoff of agricultural fertilizers can be transported by rivers over thousands of kilometers and produce considerable impacts on marine ecosystems. In addition, weather and climate information is critical for real-time monitoring and long-term risk assessment of natural disasters, such as droughts, floods, grassland and forest fires, severe weather and tropical cyclones, which can induce very strong impacts on natural and environmental resources.

At the same time, it should be stressed that weather and climate information must be disseminated in an appropriate format and language to be easily understood by the various concerned sectors: farmers, forest and water resources managers, decision-makers and the general public.

The thirteenth session of the WMO Commission for Agricultural Meteorology (CAgM-XIII), which met in Slovenia during October 2002, considered the need to provide improved agrometeorological services to the agriculture, rangeland, forestry and fishery sectors, especially with respect to the sustainable management of natural resources, and therefore established an Expert Team on Management of Natural and Environmental Resources for Sustainable Agricultural Development.

WMO and the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) subsequently organized a Workshop on Management of Natural and Environmental Resources for Sustainable Agricultural Development, which was held from 13 to 16 February 2006 at the NRCS' National Water and Climate Center in Portland (USA). The workshop brought together experts of the CAgM Expert Team on Management of Natural and Environmental Resources for Sustainable Agricultural Development with those of the USDA NRCS, as well as from other U.S. government institutions. Twenty-five participants from 9 countries participated in the workshop.

I am pleased to note that 15 papers were presented at the workshop, focusing on various key aspects of natural and environmental resources management for sustainable agricultural development. I therefore wish to thank the USDA for its active collaboration in bringing out the workshop proceedings. I am confident that these articles and the recommendations developed during the workshop discussions, which are published in this volume, will serve as a vital source of information for the National Meteorological and Hydrological Services (NMHSs) of WMO's 188 Members and for all agricultural and environmental agencies responsible for providing agrometeorological information and for supporting sustainable natural resources management in agricultural production.

(M. Jarraud)
Secretary-General
World Meteorological Organization

Welcome Remarks by Raymond Motha

On behalf of the Commission for Agricultural Meteorology, welcome to this WMO Workshop on Management of Natural and Environmental Resources for Sustainable Agricultural Development. CAgM expresses its appreciation to the Natural Resources Conservation Service for co-sponsoring this workshop in Portland, the City of Roses. I want to acknowledge Jon Werner, Director, National Water and Climate Center, Bob Graham, Oregon State Conservationist, and Bruce Newton, Director, National Technical Support Center, for hosting this workshop. I also want to thank Phil Pasteris, Leader, Water & Climate Services, National Water and Climate Center, for coordinating the logistical arrangements for the meeting and for organizing the local programme.

As many of you know, the Pacific Northwest has a tremendous wealth of natural resources. Spectacular forests, expansive rangelands, and plentiful salmon are some of the many resources found in this region. Agriculture is also highly diversified and important in the Pacific Northwest. Winter wheat, potatoes, and apples are major crops grown in the region. The Northwest depends on winter precipitation, and especially snow, for its water supplies. In the western U.S., water supplies are limited but demands for water are increasing as urban population centers rapidly expand. Thus, this region is challenged with the complex issues of managing natural and environmental resources for sustainable agricultural development in a rapidly changing world.

In 1990, the U.S. Congress specifically addressed sustainable agriculture in the U.S. Farm Bill. Under this Public Law (101-624, Title XVI, Subtitle A, Section 1603), "the term sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food and fiber needs;
- enhance environmental quality and the natural resource base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations; and,
- enhance the quality of life for farmers and society as a whole.

In the USDA/NRCS General Manual No. 180, Part 407, sustainable agriculture is defined as "a way of practicing agriculture, which seeks to optimize skills and technology to achieve long-term stability of the agricultural enterprise, while ensuring environmental protection, and consumer safety. It is achieved through management strategies that help the producer select hybrids and varieties, soil conserving cultural practices, soil fertility programs, and pest management programs. Sound resource conservation is an integral part of the means to achieve sustainable agriculture."

Moreover, sustainable agriculture does not refer to a prescribed set of practices. Instead, it challenges producers to think about long-term implications of practices and broad interactions and dynamics of agricultural systems. This is important to local and regional agricultural systems. A systems perspective is essential to understanding sustainability, encompassing the individual farm to the local ecosystem to the communities affected by the farming system. A key goal is also to understand agriculture from an ecological perspective. Sustainable agriculture is also thought of in terms of its adaptability and flexibility over time to respond to the demands on natural resources and its ability to protect the soil, water, and environmental resources. Finally, a systems approach also implies interdisciplinary resources.

This leads me to focus briefly on why we are here. Weather and climate are major factors affecting agricultural production in both developed and developing countries. Weather extremes have caused significant agricultural losses, as well as loss of life and property, in many areas around the world. Tropical cyclones striking coastal regions have inflicted immense flood and wind damage, especially to lowland agricultural areas, but also some urban areas as well; droughts plaguing major crop and livestock areas have caused serious land degradation and desertification problems; desiccating winds fueling widespread forest fires have led to major ecological and erosion concerns; and anomalous winter snowfall in mountainous regions has major consequences on summer agricultural productivity, forest fire potential, streamflow conditions, and urban water supplies. These natural disasters and extreme events can lead to crop failure, food insecurity, loss of life and property, and can negatively impact socio-economic development in the affected region.

However, measures can be undertaken to help cope with natural disasters. These include a greater awareness of the vulnerability associated with natural hazards, planning and preparedness measures to help reduce the impact of the natural disaster, and an emphasis toward risk management. A CAgM Expert Team focused on the impacts and mitigation of natural disasters and extreme events in agriculture. Their work resulted in both an ambitious pilot project and the publication of their work in a book by Springer. Natural disaster mitigation plans should be factored into strategies for managing natural and environmental resources for sustainable agricultural development. These strategies for managing natural and environmental resources for sustainable agriculture can be achieved only through effective partnerships of experts from all disciplines and with all affected sectors of society.

Agrometeorologists, climatologists, hydrologists, agronomists, foresters, conservationists, extension service personnel and economists must pool their resources to exchange ideas and to formulate recommendations for managing natural resources in this rapidly evolving world. This interdisciplinary effort is essential for sustaining agricultural development.

I want to thank all of you for coming to this meeting. Your presentations will bring a broad range of expertise, unique challenges, and potential strategies for discussion.
I sincerely wish you much success with these discussions and with the outcome of this meeting.

Thank you.