BioFach 2007

Climate Change and Organic Farming
Workshop at BioFach 2007

17 February 2007, 1 – 3 p.m.
BioFach Congress, Nürnberg Messe. Room Shanghai

Programme and Summary of the Presentations

The event is organized by the

- Research Institute of Organic Agriculture FiBL, Switzerland
- Corporación Educativa para el Desarrollo Costarricense CEDECO, Costa Rica
- Swiss Agency for Development and Cooperation (SDC), Switzerland
- Humanist Institute for Cooperation with Developing Countries, HIVOS, The Netherlands

Sponsors

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Contact

- Dr. Salvador Garibay
  Research Institute of Organic Agriculture FiBL
  Ackerstrasse
  CH-5070 Frick
  Switzerland
  Tel. +41 62 865 72 72
  Fax +41 62 865 72 73
  info.suisse@fibl.org
  Info at http://www.fibl.org/english/news/events/2007/biofach-climate.php

1 Background and Objectives

1.1 Background

Reducing the release of greenhouse gases to the atmosphere is of paramount importance for mitigating climate change and global warming.

What is the role of organic farming in mitigating the consequences of climate change? This session will provide background information and initiate debate among policy makers and stakeholders.

Presentations from Costa Rica and Brazil will show how farmers and organizations in the developing world are raising awareness of the importance of organic agriculture and climate change. It is particularly important in developing countries to build awareness in society and institutions in order to prepare and implement strategies for reducing global warming. Organic agriculture can be a valuable element of such strategies.

1.2 Objectives

The workshop has the following objectives:

- To provide background information and inform about ongoing research related to organic farming and climate change.
- To initiate a debate among policy makers and stakeholders on how organic farming contributes to mitigating climate change.
- To launch a global platform to position and promote organic farming as an alternative that contributes to climate change mitigation.

2 Programme

- Organic agriculture and climate change: The scientific evidence
  Andreas Fliessbach, Research Institute of Organic Agriculture FiBL, Switzerland
- CO2 reduction in agriculture: A comparison of conventional and organic farming systems in Costa Rica
  Manuel Amador, CEDECO, Costa Rica
- CO2 fixation by small farmers in the south of Brazil
  Ana Meirelles, Brazil
- Impacts of climate change on developing countries and adaptation strategies
  Othmar Schwank, SDC-INFRAS, Switzerland
- Possibilities to include (organic) agriculture in a future climate regime
  Jan Verhagen, Plant Research International Institute, University of Wageningen, The Netherlands
- Proposed Global CO_2 Project: Organic agriculture and its importance in the mitigation of climate change
  Salvador V. Garibay, Research Institute of Organic Agriculture FiBL, Switzerland
- Chair: Urs Niggli, Director Research Institute of Organic Agriculture FiBL, Switzerland

3 Summaries of the Presentations

3.1 The role of organic agriculture in climate change – scientific evidence

Andreas Fliessbach, Research Institute of Organic Agriculture FiBL, Switzerland

Evidence and future perspectives in climate change

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) clearly demonstrates the likelihood of changes in climate and the predictable impact on future life on earth. The monitored increases in the greenhouse gases carbon dioxide, methane and nitrous oxide have been identified as most likely being anthropogenic. While the global increase in atmospheric carbon dioxide concentration is primarily due to burning fossil fuel and changes in land use, methane and nitrous oxide emissions are primarily due to agriculture. Model calculations using different scenarios show impressively how the global climate will change over the next 100 years. Drastic political measures are needed in order to stop increases in greenhouse gases (GHG) with severe climatic effects, but predictions for a scenario in which GHG concentrations are kept constant at the level of 2005 also show lower-level climatic changes. The likelihood of a worst case scenario is high. Contributing factors are the increase of world population, the growing demand for energy mainly in developing countries, the damage to soil by extreme climatic events, the loss of carbon to the atmosphere as well as warming itself leading to higher carbon mineralization from soils.

Predicted impacts

Whilst fossil fuel use, land use change and agricultural intensification are identified as the most important drivers of climate change, the impacts will also hit agricultural production. Predicted climate change will influence weather events globally in the following ways: a) Increase in temperature in most land areas (warmer and fewer cold days and nights, warmer and more frequent hot days and nights, heat waves); b) Increase in severe weather and precipitation; c) Widening areas affected by drought; d) Increase in and northward movement of tropical cyclones; e) Rising sea levels.

Mitigation options in the agricultural sector

The most important factor to mitigate climate change is cutting emissions of CO_2 from fossil fuels – prevention is better than cure. As organic farming does not use mineral fertilizers, which are produced using fossil fuel, it is a positive contributor even though it mostly leads to lower yields. Substituting fossil fuels by biofuel is a good option as it offers indefinite positive contribution, as long as the direct and indirect energy input for its production is lower than the energy yield. Annual biofuel crops produced with high mineral fertilizer application and decreasing soil organic matter levels diminish the beneficial effects. Energy produced from perennial crops additionally sequesters carbon to the soil and – if produced in a sustainable way – these crops may serve as an infinite energy source, safeguarding the environment with minimal climatic impact. Soil emissions of methane are high in waterlogged areas (and from landfills) because the process depends on strictly anaerobic conditions; paddy rice fields and flooded areas are thus important contributors. Nitrous oxide is emitted in the process of denitrification and nitrification and is highly dependent on the actual flux rates and the amount of nitrogen applied.

Soil carbon sequestration

Despite the limitations in both annual rates and attainable soil carbon levels, sequestration of carbon in soil organic matter can contribute to climate change mitigation. In addition to removing CO_2 from the atmosphere soil carbon accumulation has positive influences on soil quality and wider environmental benefits. In the event of severe weather changes, better soil quality can

counteract the risk of losing soil fertility and stability – an important factor in safeguarding the productivity of agricultural land.

Incentives for sustainability

Smith (2004), whose work among others served as the base for this presentation, argues that any implementation of mitigation options under the control of human management will have to consider social dimensions. Integrated approaches to sustainable environmental management are necessary in order to minimize the number of losers and maximize the number of winners in this context. He proposes a "no regrets" policy, in which increasing carbon stocks also improves other environmental aspects (increase in soil fertility, decrease in soil erosion) which in turn could lead to a better profitability (improved yield). The only system of agriculture that enhances carbon stocks on croplands is organic farming (Smith *et al*, 2005). Market demand and government support are the incentives for organic farming. The system includes management practices that protect and enhance existing carbon sinks and at present it is a profitable production scheme – a win-win situation. Therefore this farming practice deserves wide adoption. That it saves fossil energy resources is a further argument.

Energy use in farming systems

Evidence from farming system trials worldwide shows that organic farming enhances carbon stocks, while productivity is lower compared to systems using mineral fertilizers and pesticides. Nemecek *et al*. (2005) found energy use in Swiss organic systems on a per hectare basis to be 46–49% lower than in a mineral fertilizer based system and 31–35% lower than in a conventional manure based system. On a crop unit basis the differences were 36–43% and 10–20% respectively. Greenhouse warming potential in organic systems on a per hectare basis was 29–32% lower than in a mineral fertilizer system and 35–37% lower than in the conventional manure based system.

Resource use and recycling

Manure based systems of the DOK farming systems trial in Switzerland had up to 15% higher organic carbon (5.4 tons/ha) than the system with mineral fertilizer (Fliessbach *et al.*, 2007). It is interesting that with identical initial manure amounts the long-term use of composted manure showed 12% (4.4 tons/ha) higher values than the use of rotted or stacked manure. Higher soil organic carbon levels in the organic systems of the DOK trial may have had implications for the documented increase in soil aggregate stability, with consequences for improved water infiltration and lower soil erosion often observable in the field.

Nitrogen use

Total nitrogen applied with manure in the organic farming systems of the DOK-trial was 36% lower than in conventional with mixed mineral and manure fertilization. Mineral nitrogen applied was even 67% lower. The lower nitrogen inputs are advantageous with respect to nitrous oxide losses considering 1.6% of the applied nitrogen (irrespective of its origin) to be lost as nitrous oxides.

The impact of livestock

Generally the amount of livestock in organic farming systems is limited, aiming at being based on a reasonable fodder production on the farm and land area to make use of the manure as fertilizers. Efficient use of this limited resource and minimum losses of nutrients to the atmosphere and the water bodies are the consequence. However, all ruminants are important methane sources, but their general avoidance is probably out of discussion. Limiting livestock density and enhancing the productive lifespan may reduce GHG emissions.

Conclusion

In conclusion the advantages of organic farming are mainly due to resource limitation, which is inherent to the system, and optimization of manure use, crop rotations, mixed livestock and crop

production systems, temporal or permanent grass-clover, and set-asides, extensification programmes and ecological measures.

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- Dr. sc. agr. Andreas Fliessbach
  Soil Sciences
  Forschungsinstitut für biologischen Landbau (FiBL)
  Ackerstrasse
  CH-5070 Frick
  Tel. +41 62 865-7225
  Fax +41 62 865-7273
  www.fibl.org

3.2 Organic agriculture, emission of greenhouse gases and carbon sequestration

Manuel Amador y Jonathan Castro

Awareness in society of climate change is growing worldwide. There is mounting evidence of the climatic impacts of human activities. The beneficial contributions of organic agriculture to human health are well known. Its potential to mitigate global warming, however, is a new aspect.

CEDECO contributes to this aspect through validation of the contribution of the organic farms to climate change mitigation and carbon sequestration. We are developing methodologies to evaluate such contributions. Through coordination with research centers and producers in different regions of Costa Rica, it has been possible to evaluate different organic production systems.

Until now we have studied physical, biological social and economical variables with the aim of developing a methodological systematization that allows us to evaluate the contribution of organic farms to climate change mitigation. Organic farms fix more carbon in the soil and generate less emissions of greenhouse gases due to their management and diversity. Farms are less dependent on external inputs. The objective of the investigation is to establish that organic farms positively reduce the emission of gases to the atmosphere and increase the carbon fixation in the soil. Furthermore with the development of methodologies, instruments and models we aim to enhance the recognition at international level of environmental services provided by the organic sector.

The first preliminary results of the investigation have confirmed the potential of organic agriculture as a tool to mitigate climate change. At the same time, the methodological systematization and the analysis model point a way forward showing how this potential can be used in the framework of recognition of environmental services.

Our work has also sought to raise awareness of the topic at Latin American level. Cuba and Brazil are good examples. Activities coordinated with FIBL have recently been launched with the objective to organize a collective process of investigation and outcomes with global impact.

The dissemination of educational material and publications, and participation in international events are further elements of a strategy to promote the issues.

- Manuel Amador
  CEDECO
  209-1009 FECOSA,
  900 norte, 25 este del costado oeste de la Corte de Guadalupe, Montelimar
  San José
  Costa Rica
  Tel. +506 236-5198/ 236-1695/ 235-5753
  Fax +506 236-1694
  E-mail: amadore@racsa.co.cr

3.3 Organic agriculture and climate change mitigation: The experience of the Ecological Center, Brazil

Ana Meirelles

The Ecological Center is an NGO working since 1985 to promote agroecological sustainability through the principles of social justice and environmental protection.

The center has been working on organic agriculture and development of local markets; both topics are highly relevant to preventing global warming.

The center has carried out activities on 1) compilation of data on the influence of organic agriculture and local markets and climate change mitigation, 2) environmental education with children 6-12 years old and older on the problems of global warming, 3) promotion campaign for consumers of organic products to enhance awareness of the positive effect on carbon sequestration through organic agriculture and develop of local markets for climate change mitigation.

These activities have been carried out in close relationship with CEDECO of Costa Rica which has been researching the theme for several years.

The activities on environmental protection have been developed with the method of Paulo Freire. The information gained with this methodology is transmitted to children. The work is based in both theory and practical experience. The first results observed: i) increased awareness among students, parents and teachers of the problem of global warming, ii) increases demand among farmers for capacity building on organic agriculture, iii) higher demand among students for more socio-environmental activities in their schools and higher education institutions.

The promotion campaign for consumers is based on printed information (e.g. brochures) beginning with two questions: 1) Do you know that what you eat has a high environmental cost? 2) Do you have habits that cause global warming? Do you know how you contribute to global warming?

These activities will continue for the year 2007.

- Ana Meirelles
  Centro Ecológico
  Litoral Norte – Rua Padre Jorge s/ n° /
  Cep: 95.568-970
  Dom Pedro de Alcântara – RS
  Brazil
  Tel./Fax: +55 51 3664.02.20
  E-mail: centro.litoral@terra.com.br

3.4 Impact of climate change on developing countries and adaptation strategies

Othmar Schwank

Climate risks of developing countries

The Stern Review (2006) and the 4th IPCC Assessment Report published in draft form on 1 February 2007 highlight that a doubling of the radiative forcing induced by anthropogenic greenhouse gas emissions to 550 ppme is likely to be reached before 2050 unless a comprehensive climate policy framework is adopted and implemented on global level within the next 120 months. Emission trends indicate that global temperatures will rise by more than 2 degrees by 2100 (likely range of projection by IPCC: 2 to 4 degrees). There is an emerging international consensus that exceeding 2 degrees could induce radical change in the physical geography of the world leading to major changes in human geography. Even at more moderate levels of warming, all the evidence – from detailed studies on sectoral impacts of changing weather patterns through to economic models of the global effect – shows that climate change will have serious impacts on world output, on human life and on the environment, in particular in developing countries. All countries will be affected. The most vulnerable – the poorest countries and populations – will suffer earliest and most, even though even though they have contributed least to the causes of climate change.

Adaptation to climate change – that is, taking steps to build resilience and minimize costs – is essential.

Sectoral impacts on agriculture/water

Based on case studies from India, the Andes and Brazil the impacts of increased climate variability and climate change will be discussed. The increasing risk of drought and flood will affect livelihoods of rural communities in particular. Changing run-off patterns of rivers fed by tropical glaciers will alter the hydrology of irrigation in Latin America and the Indian subcontinent. Increasing water use efficiency in agricultural land use will become a paramount challenge in the present and coming decades. Farming systems need to adapt to changing fair weather, drought and flood patterns. Livestock and the supply of biomass play a crucial role in mitigating the risks of changing weather patterns.

Organic farming as a response measure

The presented case studies reveal that seed and fodder banks as well as organic farming practices including preparation of compost are a key response measure and adaptation technology for irrigated and rain-fed farming systems alike. In the tropical rainforest zone of Amazonia, permaculture (zero tilling) offers opportunities to halt land degradation, enhance the storage of carbon above and below ground and improve the prospects of marginal and small farmers to generate income.

- Othmar Schwank
  INFRAS
  Gerechtigkeitsgasse 20
  Postfach
  8027 Zürich
  Switzerland
  Tel. +41 44 205 95 95
  Fax +41 44 205 95 99
  E-mail: othmar.schwank@infras.ch

3.5 Possibilities to include (organic) agriculture in a future climate regime

Jan Verhagen, Plant Research International Institute, University of Wageningen, The Netherlands

- A. (Jan) Verhagen
  Plant Research International Business Unit
  Agrosystems Research
  P.O Box 16. 6700 AA Wageningen,
  The Netherlands
  Tel. +31 317 475945
  Fax +31 317 423110
  E-mail: adrianus.verhagen@wur.nl

3.6 Proposed Global CO_2 Project: Organic agriculture and its importance in the mitigation of climate change

Salvador V. Garibay, Research Institute of Organic Agriculture FiBL, Switzerland

Organic agriculture is based on improving soil fertility, diversification and integration of crops and livestock at farm level, and a reduction in the use of external inputs. In this production system, organic matter will accumulate in the soil, while direct and indirect greenhouse gas emissions can be reduced substantially. The water balance is greatly improved and biodiversity on the farm increases rapidly. This form of agriculture compared to others has clear advantages with respect to climate change and the protection of the environment. Organic management practices save energy and build up fertility that may render the system less vulnerable, so payments and support for these benefits are justified and on these grounds farmers will be motivated for additional environmental services.

The Kyoto Protocol lays down the commitments for each signatory country. However, immediate action is required. Efforts focusing on long term activities will not be a solution to reduce the human impact on climate change in an effective and timely manner. Despite the worldwide attention and the apparent evidence to changes in climate, global solutions and efforts to distribute responsibilities in the mitigation of climate change are lacking. The numerous proposals and strategies on how to avoid greenhouse gas emissions and the predicted consequences on global climate change have hardly been implemented in political decisions. The global character of this topic requires a multinational and socio-economically balanced response. While the benefits of organic agriculture in reducing emissions and enhancing the fertility of soils are widely accepted only very few research organisations are working in this field. Coordinated international networks focussing the local problems and developments in each single climatic region and country are required for a successful strategy to reduce GHG emissions and the already experienced impact of severe weather changes

The proposed “Global CO2-Project” aims to initiate a process of understanding and cooperation on organic agriculture and its importance in the mitigation of climate change. It is important to build a global platform, where the participants jointly analyse their results, exchange their experiences, discuss future perspectives, and cooperate on how organic agriculture can be positioned scientifically, politically and within civil society as a real option to mitigate the climate change. This project will have the following main objectives:

1. To coordinate, implement and promote further investigations on organic agriculture and its importance in the mitigation of climate change.

2. To implement communication and promotion strategies on the reduction of greenhouse gas emissions, carbon sequestration and the linkages with organic agriculture.
3. To prompt changes in policies and criteria for payments for environmental services, and include organic agriculture in the Clean Development Mechanism.

- Dr. sc. ETH Salvador Garibay
  International Co-operation
  Forschungsinstitut für biologischen Landbau (FiBL)
  Ackerstrasse
  CH-5070 Frick
  Tel. +41 62 865-7282
  Fax +41 62 865-7273
  E-Mail salvador.garibay@fibl.org