UNITED NATIONS
UNCTAD

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
UNITED NATIONS ENVIRONMENT PROGRAMME

UNEP

UNEP-UNCTAD Capacity Building Task Force on
Trade, Environment and Development (CBTF)

Organic Agriculture and Food Security in Africa

UNITED NATIONS

United Nations Conference on Trade and Development
United Nations Environment Programme

UNEP-UNCTAD Capacity-building Task Force
on Trade, Environment and Development

Organic Agriculture and Food Security in Africa

United Nations
New York and Geneva, 2008

Note

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The views expressed in this volume are largely those of the authors and do not necessarily reflect the views of the UNCTAD and UNEP secretariats.

Information on CBTF activities is available on the CBTF website: htp://www.unep-unctad.org/cbtf.

UNCTAD/DITC/TED/2007/15

UNITED NATIONS PUBLICATION

Foreword

Food security is an issue of great and growing concern in many countries, particularly in Africa. Despite global pledges, the recent report of the United Nations Special Rapporteur on the Right to Food highlighted that the number of people suffering from hunger has increased every year since 1996.

Feeding over 6 billion people – and over 9 billion by 2050 – will require a wide range of creative, sustainable agricultural systems which not only provide food, but also factor in the economic value of nature-based services such as forests, wetlands and soil organisms that underpin agriculture. Simply applying the "industrial" agricultural models of the twentieth century into the twenty-first as a single, global solution will not serve us well.

The United Nations Conference on Trade and Development (UNCTAD) and the United Nations Environment Programme (UNEP), through their joint Capacity-Building Task Force on Trade, Environment and Development (CBTF), take food security very seriously and have joined forces to contribute to the search for sustainable solutions.

This study examines the relationship between organic agriculture and food security in Africa, particularly East Africa, which is where the CBTF has been implementing a project on organic agriculture since 2004. Organic agriculture is a holistic production system based on active agro-ecosystem management rather than on external inputs, and it utilizes both traditional and scientific knowledge.

The evidence presented in this study supports the argument that organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is more likely to be sustainable in the long term.

This is in line with the findings of the Food and Agricultural Organization of the United Nations (FAO) International Conference on Organic Agriculture and Food Security, held in May 2007.

Therefore, we encourage policymakers and development cooperation partners in Africa and around the world to take a new look at this promising production system with fresh eyes. It offers not only improved food security, but also an array of other economic, environmental, health and social benefits.

Supachai Panitchpakdi
Secretary-General of UNCTAD

Achim Steiner
Executive Director of UNEP

Acknowledgements

This study was prepared by Rachel Hine and Jules Pretty, University of Essex and Sophia Twarog (UNCTAD). The authors can be contacted at the Centre for Environment and Society, University of Essex, Colchester, Essex, CO4 3SQ United Kingdom, e-mail: rehine@essex.ac.uk or at the Trade and Sustainable Development Section, Division on International Trade, UNCTAD, Palais des Nations, Geneva, Switzerland, e-mail: sophia.twarog@unctad.org.

Sophia Twarog (UNCTAD) and Asad Naqvi (UNEP/CBTF) oversaw the publication process under the overall supervision of Ulrich Hoffmann (UNCTAD) and Hussein Abaza (UNEP). Praveen Bhalla (consultant to UNCTAD), Paul Stephenson (UNCTAD), Michael Gibson (UNCTAD) and Anna Griggs (formerly with UNCTAD) provided assistance on language editing issues. Karim Ouahidi (UNEP), Desirée Leon (UNEP) and Rahila Mughal (UNEP) provided administrative support. Sophia Combette (UNCTAD) designed the cover. Rafe Dent (UNCTAD) formatted the manuscript.

The authors are grateful to the following for contributing valuable information and insights to the study:

- Peter Murage, Mount Kenya Organic Farm (MOOF), Kenya;
- J Ngugi Mutura, Sustainable Agriculture Community Development Programme (SACDEP), Kenya;
- Charles Wasonga, Environmental Action Team (EAT), Kenya;
- Donati Alex Senzia, Participatory Ecological Land Use Management (PELUM), United Republic of Tanzania;
- John W. Njoroge, Kenya Institute of Organic Farming (KIOF), Kenya;
- Zia R Khan, International Centre of Insect Physiology and Ecology (ICIPE), Kenya;
- Moses Muwanga, National Organic Agricultural Movement of Uganda (NOGAMU), Uganda;
- Jordan Gama, Tanzania Organic Agriculture Movement (TOAM), United Republic of Tanzania;
- Eustace Kiarii, Kenya Organic Agriculture Network (KOAN), Kenya;
- Petra Bakewell-Stone, Norwegian University of Life Science, Norway;
- Ulrich Hoffmann, UNCTAD;
- Fulai Sheng, UNEP;
- Benjamin Simmons, UNEP;
- Gunnar Rundgren, Grolink, Sweden;
- Hervé Bouagnimbeck, International Federation of Organic Agriculture Movements (IFOAM); and
- Participants in the CBTF East African Organic Agriculture Initiative who provided feedback on the terms of reference and drafts of this paper when they were presented at CBTF meetings. Particular thanks go to members of the CBTF project's Regional Steering Committee: From Kenya: Naftali Ndugire, National Environment Management Authority; Eustace Kiarii, KOAN; and Cecilia Kimemia, Bridge Africa. From the United Republic of Tanzania: Geoffrey Kirenga and Adah Mwasha, Ministry of Agriculture, Food Security and Cooperatives; Jordan Gama, TOAM; and Loyce Lema, Envirocare. From Uganda: Florence Kata, Ben Naturinda and Bosco Okello, Ugandan Export Promotion Board; Moses Muwanga, NOGAMU; and Godber Tumushabe, Advocates Coalition on Development and the Environment (ACODE).

The CBTF East African Organic Agriculture Initiative activities were made possible through the generous financial support of the European Union, the Swedish International Development Cooperation Agency (Sida) and the Government of Norway.

Contents

Acronyms

CBTF	UNEP-UNCTAD Capacity Building Task Force on Trade, Environment and Development
C-MAD	Community Mobilization Against Desertification
CSO	civil society organization
EAOPS	East African Organic Products Standard
EAT	Environmental Action Team
EPOPA	Export Promotion of Organic Products from Africa
FAO	Food and Agriculture Organization of the United Nations
HIV/AIDS	human immunodeficiency virus/ acquired immunodeficiency syndrome
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
ICIPE	International Centre for Insect Physiology and Ecology
ICLARM	International Center for Living Aquatic Resources Management (WorldFish Center)
ICS	internal control system
IPM	Integrated Pest Management
IFOAM	International Federation of Organic Agriculture Movements
GEF	Global Environment Facility
GMO	genetically modified organism
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ha	hectare (10,000 square meters or 2.47 acres)
KIOF	Kenya Institute of Organic Farming
KOAN	Kenya Organic Agriculture Network
LOMADEF	Lipangwe Organic Manure Demonstration Farm
MEFE	Mumias Education for Empowerment
MOOF	Mount Kenya Organic Farm
NA	not applicable
NGO	non-governmental organization
NOGAMU	National Organic Agricultural Movement of Uganda
PEEST	Poverty Eradication through Environmentally Sustainable Technologies
PELUM	Participatory Ecological Land Use Management
SACDEP	Sustainable Agriculture Community Development Programme
SFO	smallholder farmer organization
Sida	Swedish International Development Cooperation Agency
TanCert	Tanzania Organic Certification Association
TOAM	Tanzania Organic Agriculture Movement
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
WHO	World Health Organization

Executive summary

Introduction

Organic agriculture is a sustainable and environmentally friendly production system that offers African and other developing countries a wide range of economic, environmental, social and cultural benefits. When the UNEP-UNCTAD Capacity Building Task Force on Trade, Environment and Development (CBTF) started its work on organic agriculture in East Africa in 2004, a key question repeatedly raised by public and private sector stakeholders in the region was to what extent organic agriculture can enhance food security in the African context. This paper was developed in response to that question. It examines the relationship between organic agriculture and food security in Africa, analysing organic agriculture's impact on food availability as well as natural, social, human, physical and financial capital in the region. Given the paper's origins, special attention has been given to East Africa throughout the paper, including analysis of 15 case studies. The conclusions and findings are, however, relevant for all African countries as well as many other developing countries around the world.

Food security and agricultural production

Modern agricultural methods have resulted in spectacular increases in productivity: more cereals and animals per hectare, more meat and milk per animal, more food output per person employed. However, the majority of the chronically hungry are small farmers in developing countries who produce much of what they eat, are often too poor to purchase inputs and are marginalized from product markets.

In the last 10 years, progress in the drive to reduce hunger has been slow and has varied around the world, in sub-Saharan Africa the number of hungry people has in fact increased by 20 per cent since 1990. In the period 2000–2002, the proportion of undernourished people in the total population of Kenya was 33 per cent, in Uganda 19 per cent and in the United Republic of Tanzania 44 per cent. The number of underweight children has also increased in Central, Western and Eastern Africa compared to an overall decline in other developing regions such as Asia, South America and North Africa.[1]

The world therefore still faces a fundamental food security challenge. Despite steadily falling fertility rates and family sizes, the world population continues to increase, and so, in parallel, will the absolute demand for food. Food demand will also shift in the coming decades, as (i) economic growth increases people's purchasing power; (ii) growing urbanization encourages people to adopt new diets; and (iii) climate change threatens both land and water resources.

The conventional wisdom is that, in order to double food supply, efforts need to be redoubled to modernize agriculture. Such a strategy has been successful in the past. But there are doubts about the capacity of such systems to reduce food poverty. The great technological progress in the past half-century has not led to major reductions in hunger and poverty in developing countries.[2]

Arguably, the most sustainable choice for agricultural development and food security is therefore to increase total farm productivity *in situ*, in the developing countries that are the most in need of greater food supplies. Attention must focus on the following:

(i) The extent to which farmers can improve food production and raise incomes with low-cost, locally-available technologies and inputs (this is particularly important at times of very high fuel and agro-chemical prices);
(ii) Whether they can do this without causing further environmental damage; and
(iii) The extent of farmers' ability to trade.

---

1 FAO, 2005; von Braun, 2005; UN/SCN, 2004.
2 Treweyas, 2002; Smil, 2000; Tilman et al., 2002; McNeely and Scherr, 2003.

The food security of any region is not simply a question of producing enough food to meet demand; it is also influenced by a multitude of factors, both natural and caused by humans. Increased food supply does not automatically mean increased food security for all. What is important is who produces the food, who has access to the technology and knowledge to produce it, and who has the purchasing power to acquire it. Furthermore, many of the causes of food insecurity are also symptoms, thus creating a cyclical effect that can result in further food insecurity.

Organic agriculture and food security

Agriculture, by its inherent multifunctionality, has the potential to both influence and address the factors that contribute to food insecurity. Organic agriculture relies on five capital assets for success (natural, social, human, physical and financial) and so contributes to and builds up stocks of these natural, social and economic resources over time[3] thus often reducing many of the factors that lead to food insecurity.

Increase in food availability

In developing countries, evidence from research and from this study shows that agricultural yields in organic systems do not fall, and at least remain stable when converting from systems that use relatively low amounts of synthetic inputs (many of which were by-passed by the earlier "green revolution") such as those frequently found in Africa. Over time, yields increase as capital assets in systems improve, thus outperforming those in traditional systems and matching those in more conventional, input-intensive systems. Food availability increased in all cases centred on food production where data were reported examined in this study. Others, such as Gibbon and Bolwig (2007), have also found that organic conversion in tropical Africa is associated with yield increases rather than with yield reductions.

Organic farming increases access to food on several levels. First, increased quantity of food produced per farm leads to household food security which results in all members of the household having access to enough food. Second, the production and selling of food surpluses at local markets means that farmers benefit from higher incomes, which increases their purchasing power. Third, fresh organic produce becomes available to more people in the wider community. Finally, organic farming enables new and different groups in a community to get involved in agricultural production and trade where previously they were excluded for financial or cultural reasons.

Benefits to the natural environment

The vast majority of the case studies in this research showed improvements to the natural capital base – their local natural environment – with 93 per cent of the case studies reporting benefits to soil fertility, water supply, flood control and biodiversity. Organic farming leads to many improvements to the natural environment, including increased water retention in soils, improvements in the water table (with more drinking water in the dry season), reduced soil erosion combined with improved organic matter in soils, leading to better carbon sequestration, and increased agro-biodiversity. As a result soils are healthier, are better able to hold water and are more stable, can sustain plant growth better and have a higher nutrient content. All this enables farmers to grow crops for longer periods, with higher yields and in marginal conditions. This of course can make a major impact on reducing the food insecurity of a region.

Benefits to community, cooperation and partnerships

Organic agriculture leads to improvements in social capital, including more and stronger social organizations at local level, new rules and norms for managing collective natural resources and better connectedness to external policy institutions. Results from the cases in this study revealed that 93 per cent of those involved cited improvements to social capital as integral to their success.

---

[3] Ostrom, 1990; Pretty, 2003.

The formation of farmers' groups and cooperatives and less formal community collaboration has lowered the costs of working, led to increased knowledge transfer amongst farmers, reduced the costs of organic certification and contributed to greater food security.

Strong networks and links with partners from government, non-governmental organizations (NGOs) and organic support organizations such as the Kenya Organic Agriculture Network (KOAN), the National Organic Agricultural Movement of Uganda (NOGAMU), the Tanzania Organic Agriculture Movement (TOAM), and the Export Promotion of Organic Products from Africa (EPOPA) programme are helping farmers to organize for organic certification, access export and domestic organic markets and gain greater knowledge of sustainable organic techniques, crops and markets.

Increase in education, skills and health

Organic farming leads to an increase in human capital, evident in all of the case studies detailed in this report. All have some element of education that increases the knowledge of organic farming methods and the skills of farmers. In many cases there have been direct improvements in the health of individuals and communities as a result of increased knowledge, an increase in food yields and improved access to food. The ability of farmers to use their better understanding of the holistic nature of organic farming to adapt and change their farming systems when faced with new challenges has resulted in these agricultural systems becoming more resilient to environmental and external stresses.

Improvements to infrastructure and markets

Organic farming can also lead to improvements in the infrastructure (communications and transport) through the need to access markets. Access to markets is an essential part of organic farming, (particularly crucial for export) and farmers, NGOs and governments can work together in order to help farmers to earn premium prices for their organic produce. Of the case studies examined, 40 per cent reported improvements in the physical infrastructure and in market access. Access to markets has increased not only for farmers selling their surplus in domestic markets, but also for farmers selling their certified organic produce in international markets.

Increase in farmer and household incomes

Poverty is a major contributory factor to food insecurity, and organic farming has a positive impact on poverty in a variety of ways. Farmers benefit from: (i) cash savings, as organic farming precludes the need to purchase synthetic pesticides and fertilizers; (ii) extra incomes gained by selling the surplus produce (resulting from the change to organic); (iii) premium prices for certified organic produce, obtained primarily in Africa for export but also for domestic markets; and (iv) added value to organic products through processing activities. These findings are backed up by studies from Asia and Latin America that concluded that organic farming can reduce poverty in an environmentally friendly way.[4]

A recent study concluded that certified organic farms involved in production for export were significantly more profitable than those involved in conventional production (in terms of net farm income earnings).[5] The majority of cases examined in this study reported improvements to the financial capital base as one of their successes. Of these cases, 87 per cent showed increases in farmer and household incomes as a result of becoming organic, which contributed to reducing poverty levels and to increasing regional food security.

---

4 UNCTAD, 2008; Gibbon and Bolwig, 2007; Twarog, 2006; UNCTAD, 2006.

5 Gibbon and Bolwig, 2007; UNCTAD, 2008.

Main findings and conclusions of the analysis

- Organic agriculture can increase agricultural productivity and can raise incomes with low-cost, locally available and appropriate technologies, without causing environmental damage. Furthermore, evidence shows that organic agriculture can build up natural resources, strengthen communities and improve human capacity, thus improving food security by addressing many different causal factors simultaneously.

- All case studies which focused on food production in this research where data have been reported have shown increases in per hectare productivity of food crops, which challenges the popular myth that organic agriculture cannot increase agricultural productivity. Organic production allows access to markets and food for farmers, enabling them to obtain premium prices for their produce (export and domestic) and to use the additional incomes earned to buy extra foodstuffs, education and/or health care. A transition to integrated organic agriculture, delivering greater benefits at the scale occurring in these projects, has been shown to increase access to food in a variety of ways: by increasing yields, increasing total on-farm productivity, enabling farmers to use their higher earnings from export to buy food, and, as a result of higher on-farm yields, enabling the wider community to buy organic food at local markets.

- Organic and near-organic agricultural methods and technologies are ideally suited for many poor, marginalized smallholder farmers in Africa, as they require minimal or no external inputs, use locally and naturally available materials to produce high-quality products, and encourage a whole systemic approach to farming that is more diverse and resistant to stress.

- The recent food-price hike and the contribution rising fuel prices have made to it highlight the importance of making agriculture less energy and external input dependent. Enhanced transition to sustainable forms of agriculture in general, and organic agriculture in particular, needs to be part of an effective response strategy to escalating food prices.

- Certified organic production for the export market, with its premium prices, can undoubtedly reduce poverty among farmers, which is a major contributor to food insecurity. However, monocropping farming systems for the export market, whether conventional or organic, still leave farmers vulnerable to export price fluctuations and crop failure. Where organic farming principles are adopted as a holistic approach for the whole of an integrated agricultural system, "organic" can be synonymous with "sustainable", and increased food security in a region is more likely to occur, while also building up natural, human and social resources.

- Organic agricultural systems are making a significant contribution to the reduction of food insecurity and poverty in areas of Africa, and to an improvement in rural livelihoods. There is the potential to do more in this area with enabling policy and institutional support.

- Organic agriculture is not directly and specifically supported by agricultural policy in most African countries; indeed, it is sometimes actively hindered by policies advocating the use of high-input farming management practices. If organic agriculture and its associated positive side-effects are to be scaled up, an enabling policy environment is critical.

- Integrated organic agriculture, whether certified or non-certified, is more management- and knowledge-intensive, and so necessitates building the learning and cooperative

capacity of individuals and groups. This requires investment in developing the social capital at the local level if organic agriculture is to spread.

- Much more is now known about intensive, high-input farming systems than is known about sustainable organic systems. Thus more information on agro-ecological technologies is needed. However, this calls for a shift of emphasis in research and science budgets, and for the creation of better linkages between scientists, agricultural training and extension providers and farmers.

- Partnerships between farmers, farmer groups, NGOs and civil society organizations (CSOs), organic movement organizations, governments and certifying bodies at all levels foster successful organic agriculture. In order to facilitate the spread of organic agriculture there is a need to work at all levels: local, national and international, as well as to encourage more links between governments, NGOs and the private sector.

- Improving agricultural sustainability through adoption of organic agriculture in Africa may not be a solution to all the food problems, but considerable progress has been made in recent years. Whether organic farming will result in enough food to meet current and future needs in response to continued population growth and development in African countries can never be totally certain, but is certainly a step in the right direction. The present situation of widespread food insecurity means that conventional farming systems are clearly unable to fulfil the current food needs in Africa. The results observed in the transition to organic agriculture are highly promising for food security in Africa. Evidence indicates that productivity in organic agriculture can grow over time.[6] With further specific support, the benefits to food security and related improvements to natural, social and human capital, could spread to much larger numbers of farmers and rural people in the coming decades.

- These conclusions are confirmed by the findings and recommendations of the recently released report of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) panel, an intergovernmental process, supported by over 400 experts under the co-sponsorship of the FAO, GEF, UNDP, UNEP, UNESCO, the World Bank and WHO (issued on 14 April 2008) stated strongly that "the way the world grows its food will have to change radically to better serve the poor and hungry if the world is to cope with growing population and climate change while avoiding social breakdown and environmental collapse." The authors found that (i) progress in agriculture has reaped very unequal benefits and has come at a high social and environmental cost; and (ii) food producers should try using "natural processes" like crop rotation and use of organic fertilizers. The authors call for more attention to small-scale farmers and utilizing sustainable agricultural practices, and specifically mention organic farming as an option several times.[7]

[6] Borlaug, 1994a and b; Avery, 1995.
[7] IAASTD, 2008.

SECTION 1. OVERVIEW

1.1 Introduction

Organic agriculture is a sustainable and environmentally friendly production system that offers African and other developing countries a wide range of economic, environmental, social and cultural benefits.[1] When the UNEP-UNCTAD Capacity Building Task Force on Trade, Environment and Development (CBTF)[2] started its work on organic agriculture in East Africa in 2004, a key question repeatedly raised by public and private sector stakeholders in the region was to what extent organic agriculture can enhance food security in the African context. This paper was developed in response to that question. It examines the relationship between organic agriculture and food security in Africa, analysing organic agriculture's impact on food availability as well as natural, social, human, physical and financial capital in the region. Given the paper's origins, special attention has been given to East Africa throughout the paper, including analysis of 15 case studies. The conclusions and findings are, however, relevant for all African countries as well as many other developing countries around the world.

1.2 Agricultural production and food security in Africa

Over the past 40 years, there has been remarkable growth in agricultural production with per capita world food production growing by 17 per cent and aggregate world food production growing by 145 per cent. Between the early 1960s and mid-1990s, average cereal yields grew from 1.2 tons per hectare (t/ha) to 2.52 t/ha in developing countries while total cereal production grew from 420 to 1,176 million tonnes per year.[3]

Over the same period, world population grew from three to six billion, but globally per capita agricultural production overtook population growth, and each person today has 25 per cent more food compared with 1960. However this is not the case for everyone – it varies regionally; in Africa, for example, food production per person is 10 per cent lower today than in 1960.

Modern agricultural methods have brought spectacular increases in productivity: more cereals and animals per hectare, more meat and milk per animal, and more food output per person employed. Any farmer or agricultural system with access to sufficient inputs, knowledge and skills can produce large amounts of food. However, the majority of the chronically hungry are small farmers in developing countries who produce much of what they eat and are often poor and lack access to inputs and product markets.

The recent advances in aggregate productivity have therefore not brought reductions in the incidence of hunger for all. In the early twenty-first century, there are still more than 800 million people hungry and lacking adequate access to food. A third of these are in East and South-East Asia, another third in South Asia, a quarter are in sub-Saharan Africa, and 5 per cent each are in Latin America and the Caribbean and in North Africa and West Asia.

Food security can be defined as a condition where "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[4] Indicators of food insecurity in a given region can include numbers of "hungry" or malnourished people, of underweight children and of people suffering from micronutrient deficiency.[5]

Although average per capita food consumption in 2003 was 2,780 kcal/day, consumption in 33

1 UNCTAD, 2006
2 Information on CBTF activities is available on the CBTF website: htp://www.unep-unctad.org/cbtf
3 FAO, 2005; Conway and Pretty, 1991; Heffernan, 1999; Smil, 2000; Pretty and Hine, 2001.
4 Gillespie and Haddad, 2001; FAO, 1996.
5 FAO, 1996.

countries is still less than the recommended 2,200 kcal/day. In addition to 852 million people that go hungry, globally there are 126 billion underweight children and over 2 billion people suffering from some form of micronutrient deficiency. Almost 50 per cent of pregnant women in sub-Saharan Africa are affected by iron deficiency anaemia.[6]

In the last 10 years, progress in the drive to reduce hunger has been slow and has varied around the world, in sub-Saharan Africa the number of hungry people has in fact increased by 20 per cent since 1990. In the period 2000–2002, the proportion of undernourished people in the total population of Kenya was 33 per cent, in Uganda 19 per cent and in the United Republic of Tanzania 44 per cent. The number of underweight children has also increased in Central, West and East Africa compared to an overall decrease in other developing regions such as Asia, South America and North Africa.[7]

The world therefore still faces a fundamental food security challenge: despite steadily falling fertility rates and family sizes, the world population continues to increase and so in parallel will the absolute demand for food. Food demand will also shift in the coming decades, as economic growth increases people's purchasing power, growing urbanization encourages people to adopt new diets, and climate change threatens both land and water resources.

World population is widely expected to reach 9 billion by the next generation, by when 84 per cent of the total population will live in those countries currently comprising the "developing" world. At the same time, land and water degradation is increasingly posing a threat to food security and the livelihoods of rural people who often live on degradation-prone lands. Although a combination of increased production and more imports will mean per capita consumption will increase by 2015, a person living in a developing country will still only consume half of the cereals and a third of the meat consumed by a person in an industrialized country, which implies that food insecurity and malnutrition will persist.[8]

1.3 The food security challenge

What makes agriculture unique as an economic sector is that it directly affects many of the natural, social and economic resources on which it relies for success. Agricultural systems at all levels rely on the value of services flowing from the total stock of assets that they influence and control. Five types of "capital" assets, natural, social, human, physical and financial capital, which are now recognized as being important,[9] are described below:

1. *Natural capital* produces environmental goods and services. It is the source of: food (farmed and harvested or caught from the wild); wood and fibre; water supply and regulation; treatment, assimilation and decomposition of wastes; nutrient cycling and fixation; soil formation; biological control of pests; climate regulation; wildlife habitats; storm protection and flood control; carbon sequestration; pollination; and landscape.[10]

2. *Social capital* produces a mutually beneficial collective action, contributing to the cohesiveness of people in their societies. The assets comprising social capital include norms, values and attitudes that prompt people to cooperate; relations of trust, reciprocity and obligations; and common rules and sanctions that are mutually agreed or handed down. These are connected and structured in networks and groups.[11]

---

6 FAO, 2005; von Braun, 2005; FAO, 2005; UN/SCN, 2004; Micronutrient Initiative and UNICEF, 2005; IFPRI, 2005.

7 FAO, 2005; von Braun, 2005; UN/SCN, 2004.

8 von Braun, 2005; Uphoff, 2002; Pinstrup-Andersen et al., 1999; Pretty and Hine, 2001.

9 Coleman, 1988 and 1990; Putnam, 1993 and 1995; Costanza et al., 1997 and 1999; Carney, 1998; Flora, 1998; Ostrom, 1998; Pretty, 1998; Scoones, 1998; Uphoff, 1998; Pretty and Ward, 2001; Pretty and Hine, 2001; Pretty, 2003.

10 Costanza et al., 1999; MA, 2005.

11 Flora and Flora, 1996; Pretty, 2003; Cramb and Culaseno, 2003.

3. *Human capital* is the total capability of individuals, based on their stock of knowledge skills, health and nutrition. It is enhanced by access to services that provide these, such as schools, medical services and adult training. People's productivity is increased by their capacity to interact with productive technologies and with other people. Leadership and organizational skills are particularly important in making other resources more valuable.[12]

4. *Physical capital* is the store of material resources made by humans, and comprises buildings, such as housing and factories, market infrastructure, irrigation works, roads and bridges, tools and tractors, communications, and energy and transportation systems, that make labour more productive.

5. *Financial capital* is more of an accounting concept, as it provides a facilitating role rather than being a source of productivity in and of itself. It represents accumulated claims on goods and services, built up through financial systems that gather savings and issue credit, such as pensions, remittances, welfare payments, grants and subsidies.

As agricultural systems shape these very assets on which they rely for inputs, a vital feedback loop occurs from outcomes to inputs.[13] The basic premise is that more sustainable agricultural systems accumulate stocks of these five assets, thereby increasing all the forms of capital over time. Sustainable agricultural systems tend to have a particularly positive effect on natural, social and human capital, while unsustainable systems deplete these assets, leaving less for future generations.

For example: (i) an agricultural system that erodes soil while producing food results in costs that others must bear;[14] (ii) another system that sequesters carbon in soils through organic matter accumulation helps to mitigate climate change; (iii) a diverse agricultural system that enhances on-farm wildlife for pest control contributes to greater stocks of biodiversity; while a simplified modernized system that eliminates wildlife does not contribute to biodiversity; and, finally, (v) agricultural systems that offer labour-absorption opportunities through resource improvements or value-added activities can boost local economies and help to reverse rural-to-urban migration patterns.[15] Agriculture is therefore fundamentally multifunctional, as it involves many unique food and non-food functions that cannot be produced by other economic sectors as efficiently.

The recent food-price hike and the contribution rising fuel prices have made to it highlight the importance of making agriculture less energy and external input dependent. Enhanced transition to sustainable forms of agriculture in general, and organic agriculture in particular, needs to be part of an effective response strategy to escalating food prices.

1.4 Causes of food insecurity

Increased food supply is a necessary though not sufficient condition for eliminating hunger and poverty. The food security of any region is not simply a question of producing enough food to meet demand; it is influenced by a multitude of factors both natural and human-made. Increased food supply does not automatically mean increased food security for all. What is important is who produces the food, who has access to the technology and knowledge to produce it, and who has the purchasing power to acquire it. Furthermore, many of the causes of food insecurity are also symptoms, thus creating a cyclical effect that can result in further food insecurity.

Box 1 shows the factors contributing to food insecurity in Africa, both natural and those caused by humans.

---

12 Orr, 1992; Byerlee, 1998; Lieblin et al., 2004; Leeuwis, 2004.
13 Worster, 1993; Pretty and Hine, 2001.
14 Often referred to as externalities.
15 Carney, 1998; Dasgupta, 1998; Ellis, 2000; Pretty et al., 2005.

Box 1. Factors contributing to food insecurity in Africa

1. Availability of food	
Lack of consistent access to food	• Enough food may be produced in a region overall, but food insecurity may persist for those who do not have the resources to buy or produce it. • Farmers may be able to produce or buy enough food for their families after harvest but may be food insecure at other times of the year.[a]
2. Natural capital	
Degraded natural resources	• A degraded natural environment, such as poor soil quality, eroded landscapes or inadequate water resources, will compromise food production in an area.
Practice of mono-cropping	• Monocropped systems are less likely to promote food security than diverse agricultural systems, which are more resilient to stresses.
3. Social capital	
Community and group issues	• Where there are poor links within and between communities, with limited networks, partnerships, trust and collective action, credit and responsibility, communities are less likely to cope with and to be able to help each other in times of hardship such as droughts, food shortages and conflict. Food insecurity and ill-health is likely to be greater in areas with lower social capital.
4. Human capital	
Lack of education and knowledge	• Lack of education and agricultural/nutritional knowledge can affect farmers' capacity to adapt to change or to cope with food production stresses.
Ill-health and diseases	• Malnourished people are not able to produce food as effectively as those who are well fed. • The prevalence of diseases such as HIV/AIDS has had serious impacts on food security and nutrition. When family members become ill or die from the virus, households are less able to produce or buy food.[b] In sub-Saharan Africa, 11 million children are orphaned by HIV/AIDS.[c] Mortality and morbidity in HIV/AIDS-affected households has led to decreased farm sizes, loss of income at household level, a higher dependency ratio and a general increase in food insecurity.[d]
Gender issues	• In many regions women are the major agricultural labour force. However, as they are not always recognized for this, they may not control household budgets and often have poor education. • In areas where men are in control over the household income, less money is spent on food when compared to those where women have control over incomes.
5. Physical capital	
Poor infrastructure	• Poor infrastructure (roads, communications and markets for example) affects food security.
Lack of access to appropriate technologies	• Lack of appropriate agricultural knowledge, technologies, methods or inputs can affect food security.
6. Financial capital	
Poverty	• Poverty remains the root cause of hunger and malnutrition in the world.[e]
Lack of access to markets	• Lack of access to markets means that farmers and communities can neither sell their surplus nor purchase food in times of shortage. This leads to inconsistent food availability thus contributing to food insecurity.
7. Other external factors	
Land-tenure issues	• Land-tenure issues can contribute to food insecurity in a number of ways which vary depending on the context. For example, in some areas if a husband dies, the wife cannot continue to farm the land and the land goes to other members of the family. In East Africa, all of the male children of a man inherit his land between them on his death, which means that each person owns increasingly smaller farm plots, making it hard to sustain enough food for the household.
Political issues	• Political problems, including corruption, collusion and nepotism, can significantly inhibit attempts to tackle food insecurity.[f]

Climate and natural disasters	• In areas prone to drought or unreliable rainfall, food security can be particularly challenging. • Plagues of natural pests such as locusts can decimate crops. • Natural disasters may destroy lives, crops, homes and landscapes. • In the last 20 years, the average number of deaths from natural disasters has been more than the average for the preceding decade.[g]
Armed conflicts and wars	• Political unrest, armed conflicts and wars contribute to food insecurity and prevent food from being produced or accessed. • Political conflicts are often associated with food insecurity as both a cause and an effect.[h]

[a] Benson, 2004.
[b] Rosegrant et al., 2005.
[c] FAO, 2002.
[d] Rugalema, 1999; Sanchez and Swaminathan, 2005; and Wagah, 2005.
[e] IFPRI, 2005.
[f] Rosegrant et al., 2005.
[g] EM-DAT, 2005.
[h] Messer and Cohen, 2004

1.5 Food security challenges for agriculture in Africa

There are two emerging food security challenges:

1. How to find ways to maintain and enhance food production while seeking both to improve the positive side-effects and to eliminate the negative ones?

This will not be easy, as past agricultural development has tended to ignore both the multifunctionality of agriculture and the considerable external costs.[16]

2. What is the best way to increase agricultural productivity in Africa and other developing countries where millions of people are still short of food?

These questions are controversial, with widely varying positions about strategies which are likely to be effective, including: (i) expanding the area of agriculture;[17] (ii) increasing per hectare production in agricultural exporting countries;[18] or (iii) increasing total farm productivity in developing countries that are the most likely to need the food.

The conventional wisdom is that, in order to double food supply, efforts need to be redoubled to modernize agriculture, as this approach has been successful in the past. But there are doubts about the capacity of such systems to reduce food poverty. The great technological progress in the past half-century has not resulted in major reductions in hunger and poverty in developing countries.[19]

Arguably then, the most sustainable choice for agricultural development and food security is to increase total farm productivity in situ, in the developing countries that are the most likely to need the food. The central questions, therefore must focus on the following:

(i) The extent to which farmers can improve food production and raise incomes with low-cost, locally available technologies and inputs (this is particularly important at times of very high fuel and agro-chemical prices);
(ii) Whether they can do this without causing further environmental damage; and
(iii) The extent to which farmers have the ability to trade.

[16] See, for example, Pretty et al., 2001 and 2005.
[17] By converting new lands to agriculture, but with the result that services from forests, grasslands and other areas of important biodiversity are lost.
[18] Mostly in industrialized countries, so that food can be transferred or sold to those who need it.
[19] Treweyas, 2002; Smil 2000; Tilman et al., 2002; McNeely and Scherr, 2003.

1.6 Sustainability in agriculture

Many different expressions have come to be used to imply greater sustainability in some agricultural systems over prevailing ones (both pre-industrial and industrialized). These include biodynamic, community-based, eco-agriculture, ecological, environmentally sensitive, extensive, farm-fresh, free-range, low-input, organic, permaculture, sustainable and wise use. There is a continuing and intense debate about whether agricultural systems using some of these practices can qualify as sustainable.[20]

However highly sustainable agricultural systems can be taken to mean those that aim to make the best use of environmental goods and services while not damaging the five assets – particularly natural, social and human capital.[21] The key principles for sustainability are to:

(i) Integrate biological and ecological processes such as nutrient cycling, nitrogen fixation, soil regeneration, allelopathy, competition, predation and parasitism into food production processes;
(ii) Minimize the use of those non-renewable inputs that cause environmental damage or that harm the health of farmers and consumers;
(iii) Make good use of the knowledge and skills of farmers, so improving their self-reliance and substituting human capital for costly external inputs;
(iv) Make productive use of people's collective capacities to work together to solve common agricultural and natural resource problems, such as pests, watershed, irrigation, forest and credit management.

Sustainability in agricultural systems incorporates concepts of both resilience (the capacity of systems to resist shocks and stresses) and persistence (the capacity of systems to continue over long periods), and addresses many wider economic, social and environmental outcomes. Agricultural systems with high levels of social and human assets are more able to adapt to change and innovate in the face of uncertainty. This suggests that there are likely to be many pathways towards agricultural sustainability; no single system of technologies, inputs or ecological management is more likely to be widely applicable than another. Agricultural sustainability then implies the need to fit these factors to the specific circumstances of different local agricultural systems.[22]

1.7 Organic agriculture

If sustainable agricultural systems are those that aim to make the best use of environmental goods and services while not damaging the five assets – particularly natural, social and human capital, then an integrated organic farming system can be considered inherently sustainable.

Unlike the conventional intensive agricultural systems, organic farming represents a deliberate attempt to make the best use of local natural resources. The aim of organic farming is to create integrated, humane, environmentally and economically viable agricultural systems that rely to the greatest extent on: (i) local or on-farm renewable resources, and (ii) the management of ecological and biological processes. Use of external inputs, whether inorganic or organic, is reduced as far as possible.

"Organic agriculture" is a defined system of agricultural production that seeks to promote and enhance an ecosystem's health while minimizing adverse effects on natural resources. It is seen not just as a modification of existing conventional practices, but also as a restructuring of whole

---

[20] Pretty, 1995; Conway, 1997; NRC, 2000; McNeely and Scherr, 2003; Clements and Shrestha, 2004; Cox et al., 2004; Gliessman, 2005; Balfour, 1943; Lampkin and Padel, 1994; Altieri, 1995; Trewevas; 2001.

[21] Altieri, 1995; Pretty, 1995, 1998 and 2005; Conway, 1997; Hinchliffe et al., 1999; NRC, 2000; Li Wenhua, 2001; Jackson and Jackson, 2002; Tilman et al., 2002; Uphoff, 2002; McNeely and Scherr, 2003; Swift et al., 2004; Tomich et al., 2004; Gliessman, 2004, 2005; MA, 2005.

[22] Chambers et al., 1989; Uphoff, 1998; Bunch and Lopez, 1999; Olsson and Folke, 2001; Pretty and Ward, 2001.

farm systems. The FAO/WHO Codex Alimentarius guidelines, recognized by UNCTAD in its *Trade and Environment Review 2006*, defines organic agriculture as *"a holistic production management [whose] primary goal is to optimize the health and productivity of interdependent communities of soil, life, plants animals and people"*. Similarly, the International Federation of Organic Agricultural Movements (IFOAM), which has over 750 member organizations in 108 countries, defines it as *"a whole system approach based upon sustainable ecosystems, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs."*[23] Principles of organic agriculture according to IFOAM are listed in box 2.

Certified organic agriculture is a subset of organic agriculture. The production of certified organic products has been objectively assessed as conforming with precise organic production standards, usually by a third party certification body.

Box 2. IFOAM's Principles of Organic Agriculture

- *Principle of Health*: Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
- *Principle of Ecology*: Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
- *Principle of Fairness*: Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- *Principle of Care*: Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Source: IFOAM, 2006b.

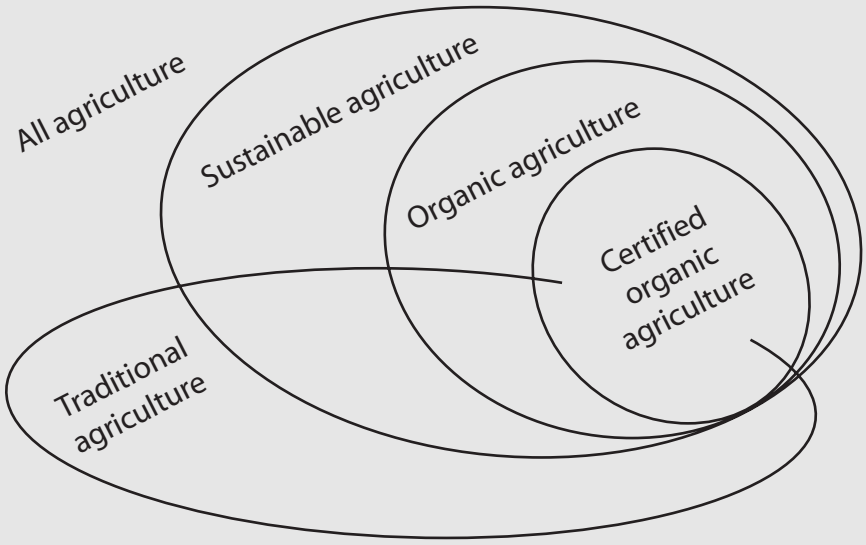
Many traditional farming systems found in developing countries practice organic techniques without seeking or receiving the premium price given to organic food in some domestic markets. Traditional agriculture includes management practices that have evolved through centuries to create agricultural systems adapted to local environmental and cultural conditions. Owing to their nature, traditional systems do not use synthetic agricultural inputs but apply ecological approaches to enhance agricultural production. Many of these traditional systems may not fully meet the production standards for organic agriculture, but can be considered near-organic.

Rather than clear divisions between the sustainable, traditional and organic agriculture farming categories described, there is often some overlap in practice.[24] Figure 1 shows some of the overlaps between agricultural practices.

[23] Lampkin and Padel, 1994; FiBL, 2000; Scialabba and Hattam, 2002; Caporali et al., 2003; Reganold, 2004; FAO/WHO, 2001; IFOAM, 2006a; IFOAM, 2002.

[24] Twarog, 2006 in UNCTAD, 2006.

Figure 1. Categories of agricultural practices in developing countries



Source: Taken from Twarog, 2006, in UNCTAD Trade and Environment Review 2006: 144.

There has been a huge growth in both the international and domestic markets for organic produce worldwide, and there are profitable returns for certified organic products. In African countries where an established and widespread domestic market for organic produce is not present, the majority of certified organic production is for export. Whereas third-party certification is essential for export of organic produce to Europe and the United States, for local markets in Africa it is not always required. Organic certification for domestic markets offers a "quality assurance" that gives the consumer the security of knowing that food has been produced according to strict organic production standards. In East Africa, along with other developing countries, low-cost, accessible solutions to guarantee the integrity of organic produce for local domestic markets are being developed, including direct sales based on trust, local certification bodies and participatory guarantee systems.

However, the costs of becoming a certified organic producer are often prohibitive for small-scale farmers in developed and developing countries alike. The practicalities and the stress of becoming certified organic are also seen as a barrier to certification. Therefore when there is a limited domestic market for organic produce, it is not necessarily critical, possible or attractive for small-scale farmers to be certified organic. The costs (if not the stress) of certification for small-scale farmers in many African countries have, however, been reduced either by: (i) the exporting company paying the certification costs, or (ii) farmers joining together to form groups and cooperatives, and thus reducing the costs to the individual.

In this study, "organic agriculture" refers to agriculture that meets organic production standards and "certified organic" refers to agriculture that is assessed subject to organic inspection, certification and labelling. "Near-organic" agriculture refers to *sustainable* traditional farming systems.

1.8 The extent of organic agriculture in Africa, particularly East Africa

The lack of a recognized system of organic agriculture data collection globally makes it is difficult to obtain reliable information on the extent of organic farming. However, organic agriculture clearly continues to grow worldwide. According to studies by IFOAM and the Foundation for Ecology and Agriculture (SOL) in Germany, the global area of land under certified organic agriculture more than quadrupled over the past decade, reaching over 30 million hectares in 2006. In addition some 33 million hectares of land were certified for organic wild collection. Globally, the market for certified organic products has been estimated at 30 billion Euros in 2006. While

sales of certified organic products are highly concentrated in Europe and North America (over 95 per cent), production is spread across the globe with developing countries having a large and ever-increasing share of production and trade.[25]

Reliable data on organic agriculture in Africa is particularly difficult to find. Only the Government of Tunisia systematically collects data on organic production. There is a great need for improved data collection on the continent, as there is no information available for nearly half of all African countries. It seems reasonable to estimate that Africa accounts for 1–3 per cent of global land under certified organic management, but a much higher percentage (in the range of 20–24 per cent) of certified organic farms.[26] This reflects the predominance of smallholder farms in organic production in Africa. In addition there are at least 8 million hectares of land certified for organic wild collection, including bee pastures, roughly a quarter of the global estimated figure.

Farmers in Africa produce a diversity of organic crops including coffee, cocoa, tea, fruits, medicinal and aromatic plants, olives, cotton, sesame, cereals, oils, nuts, spices, honey, vegetables and sugar.[27] As in most developing countries, the bulk of the certified organic products are exported. For Africa, the European Union is the main export market. Modest domestic markets for organic products are most developed in South Africa and Egypt, and have also been growing rapidly in recent years in East Africa.[28]

Organic farming is significantly more developed in North, South and Eastern Africa than other regions of Africa. In some countries the certified organic sector comprises a few large export-oriented farms that have converted to organic production (e.g. South Africa, Zambia and Malawi). In other countries the sector's growth stems from significant attempts to engage smallholders in export commodity production (e.g. Uganda and Tanzania).[29]

In East Africa, it is estimated that in 2007 Uganda had an estimated 250,000 ha under certified organic production, Kenya 181,500 ha and the United Republic of Tanzania[30] 85,000 ha.[31] These figures may include land certified for organic wild collection. Rapidly growing exports are mostly carried out by exporting companies that subcontract (mainly smallholder) outgrowers, although some cooperatives and plantations export directly. In Uganda, for example, over the past three years organic exports have been growing at an average annual rate of 67 percent. The number of farmers certified and linked to export markets increased from 28,000 in 2002 to over 200,000 in 2008, of which 90 per cent are smallholders with less than three hectares of land.[32] Key information about organic agriculture in these three countries can be found in Box 3.

In addition to estimates for certified organic agriculture in Africa, there are also large numbers of farmers that practice sustainable, traditional or near-organic agriculture. These near-organic systems do not rely on purchased inputs often because they were by-passed by the Green Revolution, or farmers do not have access to or cannot afford artificial inputs. It is estimated that in developing countries, there are probably another 10-20 million hectares of this non-certified near-organic agriculture.[33] In Africa, at least 730 000 households farming about 700 000 hectares had adopted near-organic agriculture practices in 2001, including integrated and low-external input systems. Recent evidence shows that this has increased to at least 1.9 million farmers on nearly 2 million hectares.[34]

---

25 Yussefi and Willer, 2002; Willer and Yussefi, 2007; Willer, Yussefi-Menzler and Sorensen, 2008; Grolink, 2006; Morison et al., 2005.

26 Willer and Yussefi, 2007; Bouagnimbeck, 2008; Willer, Yussefi-Menzler and Sorensen, 2008.

27 Willer and Yussefi, 2007; Taylor, 2006; Willer, Yussefi-Menzler and Sorensen, 2008.

28 IFOAM, 2007.

29 Parrott and van Elzakker, 2003.

30 Henceforth, "the United Republic of Tanzania" will be shortened to "Tanzania".

31 International Trade Centre (UNCTAD/WTO), 2007.

32 NOGAMU, 2008.

33 Wynen and Vincetti, 2002; Grolink, 2006.

34 Pretty and Hine, 2001; Pretty et al., 2005.

In Africa, a large proportion of the labour force is employed in agriculture (60–80 per cent) and the majority of these farmers (many of whom are women) are smallholders with farms of less than 2 hectares. These small farmers grow most of their basic food crops with virtually no or minimal use of synthetic fertilizers. For example 72 per cent of millet, approximately half the amount of food legumes and nearly all yams and cocoyams are produced in this way. In Uganda and Tanzania the average use of chemical fertilizers is less than one kg per hectare per year, which implies that most land is never fertilized with synthetic fertilizers.[35]

Box 3. Key information about organic agriculture in Kenya, Uganda and Tanzania

Kenya

- Organic agriculture from 1980s.
- Large private companies and civil society organizations (CSOs) have led the way with certified organics for export.
- Also smallholder farmers organized into groups – some are registered organic.
- National representative organization of stakeholders (both large companies and smallholder farmer groups) in organic agriculture - Kenya Organic Agriculture Network (KOAN).
- Mainly fruit and vegetables for export market on large scale farms but also more recently essential oils and dried herbs and spices.
- Small but expanding domestic market.
- Estimates of 181,500 ha certified organic with 35,000 farmers (2007).
- Much agricultural production is organic but not certified.
- Government recently starting to recognize role of organic agriculture. No specific policy promoting organic agriculture.
- Sections on organic agriculture included in draft revisions of soil and food policies.

Uganda

- Certified organic farming mainly smallholder farmers organized into private companies, supported by commercial exporters.
- Strong local organic movement.
- Export market since 1994 – the main driving factor for the development of organic agriculture. 14 certified organic exporters in 2005 expected 22 in 2006.
- Estimates of 250,000 ha certified organic with 60,000 farmers (2007).
- Small but expanding domestic market.
- National representative organization of stakeholders in organic agriculture - National Organic Movement of Uganda (NOGAMU).
- Much agricultural production is organic but not certified.
- No specific policy promoting organic agriculture. The organic Policy Development Committee was created in 2003 but progress has been slow due to lack of funding.
- Uganda Export Promotion Board is interested in organic agriculture.

Tanzania

- Certified organic farming for export mainly by smallholders organized into co-operatives.
- Organic cashews, pineapple, coffee, tea, honey, herbs and spices, cotton for export.
- History of low-input traditional farming, so much agricultural production for domestic markets is organic or near organic, but not certified.
- Estimates of 85,000 ha certified organic with 55,000 farmers (2007).
- National representative organization of stakeholders in organic agriculture - Tanzania Organic Agriculture Movement (TOAM) - formed in 2005.
- No specific policy promoting organic agriculture although existing National Agricultural Policy has clauses on organic agriculture and chapter on organic included in current draft revision.

Source: Walaga, 2000 and 2002; Taylor et al., 2006; Grolink, 2005; Rundgren, 2007; Bolwig et al., 2007; Willer and Yussefi, 2007; International Trade Centre (UNCTAD/WTO), 2007; Draft Report of the East African Organic Conference, May 2007, available on the UNEP-UNCTAD CBTF website at www.unep-unctad.org/cbtf.

[35] Altieri, 2002; OTA, 1998; Wynen and Vincetti, 2002.

SECTION 2. EVIDENCE FROM AFRICA

2.1 Increasing food security with organic agriculture

The food security of any region is not simply a question of producing enough food to meet demand; it is also influenced by a multitude of factors, both natural and caused by humans (see box 1). Increased food supply does not automatically mean increased food security for all. What is important is who produces the food, who has access to the technology and knowledge to produce it, and who has the purchasing power to acquire it.

Agriculture, by its inherent multifunctionality, has the potential to both influence and address the factors that contribute to food insecurity (outlined in box 1 in the previous section). As discussed below, organic agriculture can improve the availability of food, particularly for those who are the most food insecure. Organic agriculture relies on five capital assets for success (natural, social, human, physical and financial capital). It contributes to and builds up stocks of these natural, social and economic resources over time[36] thus improving food security in a long-term, sustainable manner.

2.1.1 Improvements in availability of food

In the more intensive, industrialized agricultural systems the productivity of organic agriculture tends to vary through the different stages of transition (i) in-conversion from traditional to organic management; (ii) organic management based on input substitution, and (iii) complete shift to a systems approach.[37]

Particularly in these more industrialized farming systems, after switching from synthetic inputs to organic systems farmers usually experience an initial decline in yields. After the agro-ecosystem is restored and organic management systems are fully implemented, yields increase significantly. The issue of asset accumulation over time is also important. If agricultural systems are low in natural, social and human assets – either intrinsically low, or have become damaged by degradation – then a sudden switch to organic practices that rely on these very assets will not be immediately successful and may take time to reach its full potential. However, these periods of lower yields seem to be more apparent during conversions of industrialized agricultural systems.[38]

In developing countries, evidence from research and from this study shows that agricultural yields in organic systems do not fall, and at least remain stable when converting from systems that use relatively low amounts of synthetic inputs (many of which were by-passed by the earlier "green revolution") such as those frequently found in Africa. Over time, yields increase as capital assets in systems improve, thus outperforming those in traditional systems and matching those in more conventional, input-intensive systems.

Organic farming can lead to increased food production – in many cases a doubling of yields has been seen – which makes an important contribution to increasing the food security in a region. The cases studies outlined in this report support the growing body of evidence that yield increases are possible and indeed likely, with a switch to organic farming in a variety of different contexts, particularly in marginalized areas or where traditional farming methods are used. Food availability increased in 11 out of 13 cases centred on food production examined in this study. Others, such as Gibbon and Bolwig (2007), have also found that organic conversion in tropical Africa is associated with yield increases.

Increased household food security is frequently reported after a switch to organic production, since the majority of smallholder farmers in Africa grow the bulk of their crops for domestic

---

[36] Ostrom, 1990; Pretty, 2003.
[37] Altieri, 2002.
[38] Altieri, 2002; Pretty, 2002.

consumption with only a small proportion for sale. Organic farming techniques are therefore widely recognized as increasing food security in this context, particularly in rain fed agricultural systems.[39]

Organic farming increases access to food on several levels. First, increased quantity of food produced per farm leads to household food security which results in all members of the household having access to enough food. Second, the production and selling of food surpluses at local markets means that farmers benefit from higher incomes, which increases their purchasing power. Third, fresh organic produce becomes available to more people in the wider community. Finally, organic farming enables new and different groups in a community to get involved in agricultural production and trade where previously they were excluded for financial or cultural reasons.

With the increased number and variety of crops grown and livestock reared in organic production, the farming system is integrated and more resilient to stress. Farmers in East Africa are aware of the risks of monocropping and so the security offered by integrated organic farming is welcomed. Farming families have more available food leading to household food security for more months of the year. Moreover, surplus produce can be sold to create additional income for families. Maintaining a wide variety of crops and livestock not only provides food security throughout the year but also leads to increased *nutritional* security for farmer households.

2.1.2 Improvements to natural capital

Organic farming leads to many improvements to the natural environment, including increased water retention in soils, improvements in the water table (with more drinking water in the dry season), reduced soil erosion combined with improved organic matter in soils, leading to better carbon sequestration, and increased agro-biodiversity (including in situ preservation of traditional land races which are currently being lost at alarming rates). Other environmental benefits of organic farming include less pollution, no genetic contamination and reduced energy consumption.[40]

Water conservation technologies associated with an integrated organic farming system can make a huge difference in areas where water resources are scarce. Increasing the water holding capacity of the soil enables food to be grown further into the dry season, thus increasing food security. Related improvements in the water table also result in more available water for consumption and for watering livestock.

Organic farming improves and nurtures the land's topsoil, which is widely recognized as being one of the most important resources for the farmer. Organic farmers increase the organic matter and nutrient capacity of the soil by growing leguminous crops and adding compost, animal dung or green manures. Adding elements of agroforestry, check dams and terracing (amongst other methods) also stabilizes the soil and thus reduces soil erosion. As a result soils are healthier, are better able to hold water and are more stable, can sustain plant growth better and have a higher nutrient content. All this enables farmers to grow crops for longer periods, with higher yields and in marginal conditions. This of course can make a major impact on reducing the food insecurity of a region.

In terms of the conservation of existing natural capital, including sites rich in biodiversity and so called "prime" ecosystems, organic agriculture actively promotes a protective approach. In the East African Organic Products Standard (EAOPS) 2007,[41] point 5.3.2 plainly prohibits the clearing of primary ecosystems (forests and wetlands for example) for organic production.

In terms of agro-biodiversity, where conventional productions systems have encouraged monocropping (for cashews in Tanzania or tea in Kenya for example) then the organic systems could also sometimes resemble monocrops. Simply substituting the synthetic pesticides and

[39] Walaga, 2005.
[40] Twarog, 2006.
[41] EAC, 2007.

fertilizers for purchased bio-pesticides and organic fertilizers, allowed under organic certification, can still leave the agricultural system largely unchanged. Monocropping farming systems for the export market, whether conventional or organic, still leave farmers vulnerable to export price fluctuations and crop failure. However, across the majority of the export market for organic produce in Africa there is, in reality, little monocropping.[42] Organic farms are generally more agro-biodiverse than their conventional counterparts. The EAOPS includes provisions to encourage this. Where organic farming principles are adopted as a holistic approach for the whole of an integrated agricultural system, increased food security in a region is more likely to occur, at the same time as natural, human and social resources are built up.

2.1.3 Improvements to social capital

Organic agriculture leads to improvements to social capital, including more and stronger social organizations at local level, new rules and norms for managing collective natural resources, and better connectedness to external policy institutions.

Many organic and near-organic practices inherently focus on social and participatory processes that lead to increased social capital. People's capacity to work together on common resource management problems is improved. They may, for example, form groups for joint management of pests, irrigation, watershed, forest and credit. Formation of working groups benefits farming households where labour shortages occur, for example when people are ill, suffering from HIV/AIDS, or in times of hardship. The creation of cooperatives and marketing groups also helps farmers (i) share knowledge and good practices, (ii) share the costs of organic certification and (iii) meet the demands for large quantities of organic produce required at one time by some export companies.

Strong networks and links with partners from government, NGOs and organic support organizations such as KOAN, TOAM, NOGAMU and EPOPA are helping farmers to organize for organic certification, access export and domestic organic markets and gain greater knowledge of sustainable organic techniques, crops and markets.

2.1.4 Improvements to human capital

Organic farming leads to improvements to human capital. This includes: increased knowledge and skills; improved capacity of farmers to experiment and solve their own problems; improvements in health such as reduced incidence of malaria in rice-fish zones; increased self-esteem in formerly marginalized groups; increased status of women; better child health and nutrition, especially in dry seasons; and reversed migration and more local employment.

Organic farming can result in increases in education and knowledge on several levels. Organic agriculture gives incentives to preserve and build upon farmers' traditional and indigenous knowledge of agriculture and local ecosystems. Using organic techniques and principles further increases the knowledge and skills of farmers, including their analytical skills and capacities to innovate and control their own farm systems. The ability to manage more complex systems (for example to farm for beneficial insects) requires a higher level of human knowledge and skills than is needed to spray a pesticide. This increased knowledge of natural pest and predator relationships increases farmers' resilience and capacity to implement changes in times of pest infestation.

In addition organic farming has another knock-on effect for impacting on education. The capacity for organic systems to increase the amount of food produced per household means that families can sell surpluses when they are food secure, often at premium prices. The additional income generated is available for paying school fees, thus increasing the education of the wider community.

A transition to organic farming can greatly benefit the health of farmer households and the wider community. An integrated organic farming system leads to increases in production and the variety

[42] Rundgren, 2007.

of crops grown or animals kept which positively increase the health and nutritional status of farmer households. The availability of surpluses also creates better access to food for non-farming households and so positively affects the health of the community. Selling excess food and gaining the premium prices for organic produce means that additional income is also available for medical expenses, leading to better health, particularly for children.

Farmer and farm family health is also improved with organic farming through the cessation of spraying with synthetic pesticides. Risks of illness and death associated with inappropriate use, overuse or misuse of pesticides are completely removed with a switch to organic farming.

Undernourished people infected with HIV/AIDS develop the full symptoms of the disease more quickly than people who are well fed.[43] The increased nutritional value from the greater variety of produce grown, together with the higher quality of organic produce leads to improvements in the health of those suffering from HIV/AIDS. In sub-Saharan Africa 11 million children have been orphaned by HIV/AIDS so extending the life of a farming parent by several years could mean the difference between life and death for the children left behind.[44]

2.1.5. Improvements to physical capital

Organic farming can also lead to improvements in the infrastructure (communications and transport) through the need to access markets. Access to markets is an essential part of organic farming, (particularly crucial for export) and farmers, NGOs and governments can work together in order to help farmers to earn premium prices for their organic produce. Government policy such as the Plan for Modernisation of Agriculture (PMA) in Uganda has recognized that profitable market engagement is likely to lead to increased food security.[45] New partnerships have formed which in turn may lead to increased communication networks and potentially to increased transport links. Organic farming in Africa has undoubtedly increased the access to organic markets both in terms of numbers of farmers and types of farmers (small-scale producers organized in groups).

2.1.6 Improvements to financial capital

Poverty is a major contributory factor to food insecurity, and organic farming has a positive impact on poverty in a variety of ways. Farmers benefit from: (i) cash savings, as organic farming precludes the need to purchase synthetic pesticides and fertilizers; (ii) extra incomes gained by selling the surplus produce (resulting from the change to organic); (iii) premium prices for certified organic produce, obtained primarily in Africa for export but also for domestic markets; and (iv) added value to organic products through processing activities. These findings are backed up by studies from Asia and Latin America that concluded that organic farming can reduce poverty in an environmentally friendly way.

A recent study concluded that certified organic farms in East Africa involved in production for export were significantly more profitable than those involved in conventional production (in terms of net farm income earnings). There are also substantial differences in profitability between different cash crops for organic production. UNCTAD (2008) states that in tropical Africa "At over $2,000 a year, the average income of organic pineapple growers was three times higher than for organic cocoa-vanilla farmers and more than five times higher than for organic coffee farmers."

Organic farming, by its inherent holistic and integrated nature involves the use of locally-available and appropriate natural inputs rather than purchased synthetic fertilizers and pesticides. In many cases where farmers have been forced to take out high-interest loans in order to purchase such synthetic agricultural inputs this has put a considerable strain on household budgets. Because organic farmers are no longer purchasing inputs or taking out these loans, the profit margins therefore increase on the farm and farmers are better off financially.

---

43 Sanchez and Swaminathan, 2005; Fawzi et al., 2004; Piwoz and Preble, 2000.

44 FAO, 2002.

45 Gibbon and Bolwig, 2007; UNCTAD, 2008.

The premium prices received for organic produce is a key benefit for farmers. Involvement with the rapidly expanding organic export market has been the driving force behind the move towards organic agriculture in East Africa. Increasingly the growth of organic domestic markets means that farmers have better access to markets and further increased incomes. This improved purchasing power brings many associated benefits to the farmers, farmer families and local communities alike.

Organic agriculture has also been shown to enable new and different groups in society to get involved in agricultural trade. Women in East Africa are very often not able to access synthetic agro-inputs or the credit to buy them. This has historically put them at a disadvantage in agriculture. Organic agriculture however negates the need to purchase agro-inputs and so women can farm on an equal level, thus empowering them. Selling surpluses of produce at local markets also increases women's income which again leads to improved health particularly for women and children.

There are often increased employment opportunities associated with organic production. These could include jobs related to organic production, selling surpluses, accessing export markets, producing bio-inputs and adding value to organic products through processing and marketing activities.

2.1.7 Improvements to external factors

A simple transition to organic agriculture is not likely to be able to prevent armed conflicts and wars, alter the climate or reduce political problems such as corruption, collusion and nepotism. However, the increased human and social capital associated with organic farming improves farmers' ability to respond more effectively to these challenges. For example, how farmers react to natural disasters and cope with environmental problems such as droughts and flash flooding can be positively affected by adopting organic technologies. Increased knowledge of natural pest and predator relationships increases farmers' resilience and capacity to implement changes in their farms during times of pest infestation.

How the land responds to and recovers from stresses such as flooding and erosion can also be positively affected by organic practices. The water conservation technologies and the increased water holding capacity of soils means that farming systems are more resilient to stresses of droughts. Improved soil structure and agro-biodiversity often makes soils more stable and less prone to erosion in times of heavy rainfall or flooding.

2.1.8 Summary

There is ample evidence (see later in this section) that production of organic food and beverages for both export and domestic markets can result in increased farmer incomes. This reduces poverty and improves food security of farming households as well as their access to education and healthcare. As improved education and healthcare positively impact future income streams, the benefits of organic agricultural production are long-lasting.

Where organic farming principles are adopted as a holistic approach for the whole of an integrated agricultural system, increased food security in a region is more likely to occur, at the same time as natural, human and social resources are built up. Organic agriculture is therefore important for meeting local food requirements while providing protection and sustainable use of natural resources. Organic farming makes it possible to save on production costs (no expenditure on synthetic inputs), promote economic viability and encourage food self-reliance. In areas where farmers have no access to modern inputs and technologies or in regions where natural resources are poor, organic agriculture can increase the productivity of traditional systems by making better use of locally-available natural resources and is therefore particularly appropriate for the rural communities that are currently most exposed to food shortages.[46]

[46] Hine and Pretty, 2001; Altieri, 2002; Pretty et al., 2005; IFOAM, 2006c.

2.2 Evidence on organic agriculture and food availability in Africa

Some of the most significant progress in the last two decades towards sustainability in agriculture and its associated potential to reduce food insecurity has occurred in developing countries.[47] The largest study examining sustainable agriculture initiatives in developing countries comprised the analysis of 286 projects covering 37 million hectares in 57 countries.[48] The study found that when sustainable agricultural practices covering a variety of systems and crops were adopted, average crop yields increased by 79 per cent.

For this current study, the database on agricultural sustainability was reanalyzed to produce a summary of the impacts of organic and near-organic projects on agricultural productivity in Africa.[49] As can be seen in box 4, the average crop yield increase was even higher for these projects: 116 per cent increase for all African projects and 128 per cent increase for the projects in East Africa.

Box 4. Agricultural productivity performance of organic and near organic agriculture in Africa

Region	Number of countries represented	Number of projects analysed	Number of farmers in projects (million)	Number of hectares under organic and near-organic agriculture (million ha)	Average change in crop yields compared with beginning of projects (per cent)
Africa (all countries with data)	24	114	1,900,000	2.0	+116
East Africa	7 (Kenya, Malawi, Tanzania, Ethiopia, Uganda, Zambia)	71	1,600,000	1.4	+128
East Africa (countries focused upon within this study)	3 (Kenya, Tanzania and Uganda)	44	1,300,000	1.2	+120
Kenya	1	18	1,000,000	0.5	+179
Tanzania	1	9	27,000	0.06	+67
Uganda	1	17	241,000	0.68	+54

Note: Variations in the increases in yields do not necessarily mean that organic agriculture is more or less inherently successful by country. Rather yield increases vary depending on the type of project and the crops/livestock produced.

2.3 Typology of mechanisms by which organic agriculture improves natural, social, human, physical and financial capital

As has been demonstrated in sections 2.1 and 2.2, organic agriculture has clearly produced increases in food production. Moreover, a switch to organic farming has led to other improvements including environmental improvements, strengthened communities, improvements in the education and health of individuals and a reduction in poverty.

---

47 Uphoff, 2002; McNeely and Scherr, 2003; Pretty et al., 2003.

48 Pretty et al., 2005.

49 These projects are those in Africa that meet or very nearly meet organic production standards. The projects need not be certified as organic by a third party.

Drawing on such empirical evidence, a typology of mechanisms for improvement has been developed to demonstrate where alterations in the farming system and a switch to organic farming methods can result in improvements to natural, social, human, physical and financial capital.[50] The first four mechanisms for improvement positively affect the environment (natural capital) in different ways; the next two improve social and human capital (mechanisms five and six), the next one refers to physical infrastructure and access to markets (mechanism seven) and the last three involve improving financial returns to farmers and/or their access to finance and credit (mechanisms eight to ten). See box 5.

Box 5. Improvement typology for organic agriculture

Improvement	Mechanism	**Details**
Natural capital – the environment	1. Better use of locally-available natural resources	A wide variety of technologies and practices are available which farmers and communities can use to make better and more productive use of available natural resources. Options include water harvesting, soil and water conservation e.g. contour cropping, terraces, minimum tillage, grass strips; composting, livestock manures; irrigation scheduling and management; restoration of degraded or abandoned land; rotational grazing; habitat management for pest-predators; drainage systems and sub-soiling; raised beds; bio-pesticides and bio-fungicides.
	2. Intensify microenvironments in farm system (gardens, orchards, ponds)	A further improvement to farm systems involves the intensification of a single sub-component of the farm, while leaving the rest alone. Examples include double-dug beds, adding vegetables to rice bunds, kitchen gardens, silt traps, gully cropping and digging a fish pond. These technologies can significantly increase total food production – particularly protein and vegetables – for rural livelihoods, The beneficiaries are often children during `hungry' seasons.
	3. Diversify by adding new regenerative components	The third type of improvement to natural capital involves the diversification of the whole agro-ecosystem through addition of new regenerative components, such as legumes in cereal rotations (cover crops, green manures), fish in rice, natural enemy releases for pest control, agro-forestry and integrated livestock. These technologies can result in synergistic interactions – where one component of the system positively contributes to the success of other components.
	4. Removal or better use of non-renewable inputs and external technologies	Where external and non-renewable inputs are being used, then the system can be made more sustainable by ensuring precise applications of inputs with little or no wastage or damage to natural or human capital. Such approaches are similarly combined with introduction of regenerative alternatives. Options include new seeds, patch spraying of botanicals, low dose and non-toxic sprays, veterinary services, pheromones, sterile males, resistant crop varieties and livestock breeds, and machinery (e.g. hand tools, ploughs).

[50] Pretty and Hine, 2001.

Social capital –people and groups	5. Social and participatory processes leading to group action	These improvements focus on social and participatory processes that lead to social capital increases where people's capacity to work together to solve common problems is strengthened. This includes forming groups for pest, irrigation, watershed, joint forest or credit management. It also includes horizontal partnerships between external agencies (e.g. government and NGOs; private and public).
Human capital - individuals	6. Human capital building through continuous learning programmes	These improvements focus on building the knowledge and skills of farmers to improve their analytical skills and capacities to innovate and control their farm systems. A major constraint in the transition toward more sustainable systems has been the lack of knowledge and skills needed for management of more complex systems. It is much easier, for example, to spray a pesticide than it is to farm for beneficial insects. These improvements include farmer field schools for improving agro-ecological knowledge; leadership training; adult literacy classes; computer-based knowledge development; farmer-to-farmer extension and experimentation programmes.
Physical capital	7. Access to markets and infrastructure	Improving access to domestic markets both to sell surpluses and purchase food in times of food insecurity. Improving the infrastructure (transport links and communications networks) is crucial for farmers wanting to access both domestic and international export markets.
Financial capital	8. Access to affordable finance (credit, grants, subsidies)	Improving access to finance is a vital way to help farm families develop more sustainable systems of management. This may be in the form of affordable and accessible credit (e.g. through micro-finance institutions and social organizations, particularly of women), or through families accessing new sources of external finance (grants and subsidies, or from tourists and visitors).
	9. Adding value by reducing losses or processing	A variety of options are available to increase the returns to families from their production, either by reducing losses due to pests (through better storage and treatment) and inefficient processes (e.g. through fuel-saving stoves) or by adding value before sale or use (conversion of primary products through processing).
	10. Adding value through direct or organized marketing to consumers	Farm families can also add value to their production through better marketing. This may involve improvements to physical infrastructure (e.g. roads, transport) and direct marketing and sales to consumers (thus cutting out wholesalers and `middlemen'). The latter includes rural farmers' markets, box schemes, farm shops and direct mailing and community supported agriculture; producer groups for collective marketing; ethical trading schemes; green tourism schemes.

Source: Adapted from Pretty cited in Sciallaba and Hattam 2002

Each type of improvement, by itself, can make a positive contribution to raising production in an agricultural system. But as the case studies show, using a combination of different improvement types generates synergies (where the whole is greater than the sum of the parts). For example, soil and water conservation that emphasizes terracing and other physical measures to prevent soil loss is much more effective when combined with biological methods that increase the productivity of the system, such as green manures and cover crops, or with finance for credit groups that reduces indebtedness of households.

2.4 Narrative case studies from East Africa

To illustrate these improvements in food production and in other areas, 15 case studies of examples of organic and near-organic agricultural systems from East Africa are presented below.

2.4.1 The Manor House Agricultural Centre, Kitale, Kenya[51]

The Manor House Agricultural Centre was founded in 1984 in response to a three-year drought. The Centre's training and research complex includes demonstration gardens and livestock facilities that provide a working model of bio-intensive agricultural systems for trainees, visitors and members of local communities. The Centre provides practical training to young people, farmers and staff of government agencies and NGOs. It also conducts adaptive research. In 1999 the Centre had trained some 6,000 farmers in 185 community groups, of whom 3,000 are known to have adopted bio-intensive agriculture (BIA). In 2005 Emaunel Omondi reports that over 70,000 Kenyans have been taught BIA either directly or indirectly by the Centre. The main impact has been on vegetable production. Many have doubled their yields by adopting double digging and composting, using local natural methods of pest and disease control (such as planting sunflowers to attract predators, using local plants extracts to control maize stalk borer, and intercropping to reduce tomato blight). There have been big savings on pesticides, as farmers have cut out their use. Farmers found phosphorus to be limiting over periods of six years of composting, and so bone meal is being brought in to add to compost. The Centre encourages these farmer groups to train neighbouring farmers.

A former pupil at Manor House, Susan Wekesa tells how learning to use bio-intensive farming methods impacted her life: "*The lessons I had from Manor House and those that I continue to receive from Eric Kisiangani and his colleagues at Rural Technology Centre have moved my household from misery to normal rich life comparatively. My small "shamba" is producing surplus which I sell for income. Last season, April to June, I earned Kshs. 15,000 ($ 268) from sales of Sukuma Wiki (similar to tree collards). My 0.3 acres of land is producing plenty of healthy vegetables that bring money to knock at my door in the wee hours of the day. I mean, people come knocking at the door of my house before 6:00 a.m. wanting to buy vegetables. Apart from food and money for my family, I am able to fertilize my soil from material that it produces and supports. BIA has recreated hope in me and my household. I can now face the future proudly".*

Key benefits of case study 1

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

2.4.2. Organic cotton, GTZ, United Republic of Tanzania[52]

Cotton is the second most important export for Tanzania and is generally produced by smallholders

[51] Source: University of Essex SAFE Research Database, 2001; Ecology Action, 2000 and 2005; http://www.growbiointensive.org/biointensive/Kenya.html and http://www.growbiointensive.org/newsletter/may2000/biointensive-applic-3.html.

[52] Source: G Ratter in "Organic Cotton" by D Myers and S Stolton (1999, IT Publications). University of Essex SAFE Research Database 2001

using few agricultural inputs, in two main areas – the "Western Cotton Growing Area" (WCGA) and the "Eastern Cotton Growing Area" (ECGA). In 1994 the Tanzanian Government liberalized the cotton market to allow private companies to buy seed cotton from farmers and to run ginneries. One such company, CIC Limited (a Tanzanian textile company), approached the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)-Protrade programme in order to undertake an organic cotton feasibility study. A village in the Meatu District, Shinyanga Region, Northwest of the country in the WCGA, was chosen as the project area and 45 contracted farmers produced organic cotton in the 1994/5 season. This area was particularly suitable for the project for several reasons: Cotton is produced here at low-yield levels, so the risks of falling yields during conversion were less and therefore farmers were keen to participate; most farms have areas of fallow lands to act as refuges for natural enemies of insect pests; and farmers have large numbers of cattle that can provide animal manure fertilizers for their cotton crop. The GTZ-Integrated Pest Management (IPM) project offered support in training of extension staff and research and two private ginneries were under construction in the area. Project farmers agreed to organic cultivation and to practice crop rotation and the cultivation of trap crops for insect pest control in return for inputs and guaranteed markets for their cotton. By the late 1990s, the project consisted of 134 farmers, producing an average of 663 kg/ha of cotton with the cotton officially certified as organic. Although increased food security was not a direct objective of GTZ's organic cotton farms, the increased knowledge of farmers towards a holistic approach to farming coupled with the other improvements, are likely to have a knock on effect for food security by tackling poverty within the region.

Key benefits of case study 2

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	NA
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.3 SACDEP, Thika, Kenya[53]

Sustainable Agriculture Community Development Programme (SACDEP) Kenya is an indigenous NGO that has worked for the 13 years with over 30,000 smallholder farmers. Based in Thika in Central Kenya, SACDEP facilitates training programmes for farmers in sustainable agriculture and community development with a focus on production, processing, agro-marketing, and savings and credit schemes. It is currently working with 4,500 smallholder farmers in Eastern and Central provinces of Kenya. SACDEP mainly works on a weekly basis with farmers in organized community groups of about 30 families. SACDEP operates under the four principles of sustainable agriculture (i) ecological feasibility, (ii) environmentally friendly, (iii) social justness and (iv) cultural acceptability. Topics covered in the SACDEP training programme include natural soil fertility management; integrated environmentally friendly weed, pest and disease protection; on-farm soil and water conservation techniques; and farm level seed conservation. Farmer groups are trained by SACDEP for three to four years during which productivity has been reported to increase by 50 per cent giving the farmers food security and surplus produce to sell. SACDEP also facilitates the development of Smallholder Farmers Organizations (SFOs) that address common issues such as adding value, marketing, savings and credit. SFOs in this development stage also

[53] Source SACDEP, 2006, personal communication.

agree on sustainable and organic norms for all the producers in the group to use. Incomes have increased by 40 per cent, enabling farmers to meet basic needs such as paying school fees and medical expenses.

Key benefits of case study 3

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

2.4.4 Certified organic cotton in Uganda[54]

Cotton production was introduced in Uganda in the 1940s, but the production virtually stopped between 1972 and 1986 due to poor prices and an unfavourable policy environment. Since 1986 there has been a revival in agriculture and a renewal of the cash crop sector, which has opened the way for organic cotton production in certain districts of Uganda, including in the low-potential east and north-east of the country. In 1994 organic cotton production only involved 200 farmers. By the year 2000, some 24,000 had become organic.

The majority of cotton producers are small-scale resource-poor farmers. Soil fertility and pest management is maintained through traditional cultural practices such as fallowing, crop rotations and natural pest control. Although agricultural policy generally promotes the use of pesticides, some areas of Uganda are now exempt from pesticide promotion campaigns and some districts are now promoting organic agriculture.

Key benefits of case study 4

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	NA
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

Organic cotton production achieves yields of 1,000–1,250 kg/hectare of seed cotton giving approximately 300–320 kg of cotton lint. Recent studies have reported that organic farmers have started to obtain high cotton yields compared to conventional farming systems. In addition organic cotton receives premium prices, on average a 20 per cent organic premium on export, which

[54] Source: Walaga, 1997; van Elzakker and Tulip, 2000; Rundgren 2007

translates to a 15–20 per cent premium on farm-gate prices. Organic cotton farming is therefore economically viable and this has tempted many farmers into organic production.

Organic cotton production is mainly a private-sector market-driven business activity organized by exporters while the conventional system is under government promotion. Organic cotton production is well-structured and received extensive support from the Export Promotion of Organic Products from Africa (EPOPA) financed by the Swedish International Development Cooperation Agency (Sida) until 1999. However, the organic cotton business has continued to develop since this time without this extensive support. EPOPA works with large groups of smallholder farmers (e.g. cooperative unions), giving technical advice on production and marketing.

2.4.5 C-MAD programme, Kenya[55]

The Community Mobilization Against Desertification (C-MAD) programme works in a `low-potential' part of South Nyanza, western Kenya. The programme area has a single rainfall season, and the land is badly degraded due to overgrazing and deforestation. The project began as a straightforward tree-planting effort, expanded to incorporate soil conservation, soil fertility and organic farming methods, and now focuses on whole farm improvements. The social processes incorporate participatory learning methods, farmer-based research groups, strengthening community and village groups, and collaboration with government and non-government research and extension agencies. It works with about 500 farmers on some 1,000 hectares, who have seen maize yields increase from about 2 to 4 t/ha. Income has also increased for many farmers following the cultivation of fruit (citrus, orange, mango and pineapple). The project reports increased local employment through growth in demand for on-farm labour. The cultivation of vegetables in home gardens has further improved domestic food security. The project also reports reduced child mortality and improved health and nutritional status.

Key benefits of case study 5

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.6 Small-scale aquaculture in Malawi[56]

The International Center for Living Aquatic Resources Management (ICLARM) works to integrate pond fish culture into low input farm systems in Malawi. The programme uses a participatory process for farmers and scientists to jointly map resource flows on farms and then to identify the potential for adjustments that would bring synergistic effects. It has worked with some 2,000 individual farmers on both vegetable improvements in home gardens and fish-pond aquaculture. This integrated agriculture-aquaculture component of farmers often comprises only 500 m^2 within an average farm size of 1.5 hectares. Yet intensification of just this core component has led to significant improvements in food security — vegetable yields have grown to 2,700 to 4,000 kg/ha, and fish ponds produce the equivalent of 1,500 kg/ha of fish — a new source of high-protein food

[55] Source: Peter Omondi, C-MAD and Questionnaire for University of Essex SAFE Research Database.

[56] Source: Randall Brummet, Daniel Jama; Brummet, 2000; Questionnaire for University of Essex SAFE Research Database.

for households. These integrated farms also produce six times more cash than conventional farms — with the vegetable-fish element contributing up to 70 per cent of annual cash income. ICLARM has documented the steady improvement of productivity in these systems amongst collaborating farmers — with pond productivity increasing steadily from 800 to 1,500 kg/ha. Amongst those farmers trained only through the conventional Training and Visit system in southern Malawi, yields by contrast have fallen steadily, as the over-designed systems unravelled as farmers lost control. An asset-building approach, building both on natural capital on the farm and farmers own human capital (skills and knowledge) allows for continuous readjustments over time.

Key benefits of case study 6

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.7 ICIPE vutu-sukumu *(push-pull) pest management in smallholder systems, Kenya*[57]

The work of the International Centre of Insect Physiology and Ecology (ICIPE) is explicitly focused on designing low-cost integrated pest management technology. It works closely with farmers to test and adapt technologies. It is producing unexpected synergistic effects through manipulation of agricultural systems and the paradigms that define them. One activity is investigating novel habitat management approaches to suppress cereal stem borer and *Striga* populations in maize and sorghum. This project is developing novel 'push-pull' strategies to repel stem borers from the cereal crop and attract them to intercrop or barrier forage grasses. It has found extraordinary multi-functionality in a range of fodder grasses and legumes in cereal systems. The strategy involves trapping pests on highly susceptible trap plants (pull) and driving them away from the crop using a repellent intercrop (push).[58]

---

[57] Sources: Hans Herren; John Pickett; ICIPE annual reports; Pickett, 1999; Khan et al, 2000; ICIPE 2005.

[58]
- The forage grasses, Pennisetum purpureum (napier grass) and Sorghum vulgare sudanense (Sudan grass), attract greater oviposition by stem borers than cultivated maize.
- Non-host forage plants, Melinis minutiflora (molasses grass) and Desmodium uncinatum (silver leaf) repel female stalk borers (Chilo spp).
- Intercropping with molasses grass (Melinis minutiflora) increases parasitism, particularly by the larval parasitoid, Cotesia sesamiae, and the pupal parasitoid Dentichasmis busseolae. Melinis contains several physiologically active compounds. Two of these inhibit oviposition (egg laying) in Chilo, even at low concentrations.
- Molasses grass also emits a chemical, (E)-4,8-dimethyl-1,3,7-nonatriene, which summons the borers' natural enemies.
- Napier grass also has its own defence mechanism against crop borers: when the larvae enter the stem, the plant produces a gum-like substance kills the pest.
- Sudan grass also increases the efficiency of the natural enemies (the parasitism rate on larvae of the spotted stem borer, Chilo partellus, more than tripled – from 4.8 per cent to 18.9 per cent – when the grass was planted around maize in a field and increased from 0.5 per cent to 6.2 per cent on Busseola fusca, another important pest).
- ICIPE has found that intercropping maize with the fodder legumes Desmodium uncinatum (silver leaf) and D. intortum (green leaf) reduced infestation of parasitic weed, Striga hermonthica by a factor of 40 compared to maize monocrop. Reduction in Striga infestation by intercropping maize with the two species of Desmodium was significantly more than intercropping maize with soybean, sun hemp and cowpea.

Researchers from ICIPE and IACR-Rothamsted have found that such 'push-pull', using the attractive plants as trap crops and repellent plants as intercrops, reduces stem borer attack and increases levels of parasitism of borers on protected maize, resulting in a significant increase in yield. Farmer participatory trials in 1997 and 1998 have shown significant yield increases in maize. The aim is now to develop a maize-based cropping system that will reduce yield losses due to both stem borer and *Striga* and at the same time improve soil fertility due to nitrogen-fixing action of *Desmodium.* Such a redesigned and diverse system has many of the characteristics of `traditional' farms in Kenya. ICIPE has trained a network of farmer teachers and now over 3,000 farmers have adopted these push-pull technologies.

Key benefits of case study 7

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	

2.4.8 Ethiopia: Cheha integrated rural development project[59]

This is an example of an integrated and relatively small-scale project making a substantial impact on regional food security. The project has been working in south-west Ethiopia since the drought of 1984. It has introduced new varieties of crops (vegetables) and trees (fruit and forest), promoted organic manures for soil fertility and botanicals for pest control, and introduced veterinary services. Some 12,500 farm households have adopted sustainable agriculture on about 5,000 ha, resulting in a 70 per cent improvement of overall nutrition levels within the project area, along with a 60 per cent increase in crop yields. Some farmers have begun to produce excess crops which they sell in local markets, earning much needed income for their families. Thus an area once entirely reliant on emergency food aid has now become able to feed itself and has enough left over to contribute to surplus. The real promise of the programme, however, lies in the fact that farmers themselves are taking the initiative to replicate activities (including farmers outside the project area), where once they had to be encouraged to participate through food-for-work payments.

Key benefits of case study 8

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

[59] Source: Food for the Hungry International and Questionnaire for University of Essex SAFE Research Database 2001

2.4.9 MEFE project, Kakamega, Kenya[60]

The Mumias Education For Empowerment (MEFE) project works with some 2,070 households in Kakamega, an area of western Kenya characterized by high rates of rural malnutrition, infant mortality and illiteracy. Severe food insecurity affected one in four people before the project, with many households only food secure for one to three months per year. The project uses a structured learning process (REFLECT) to encourage all groups to critically analyse their own environment and to seek new solutions based on locally-available resources along the lines of organic production practices. The project uses a range of integrated pest management methods together with legumes, cover crops and green manures for soil fertility improvement. Raised beds have been incorporated on farms to increase vegetable production. As a result, beans and groundnut yields have doubled from 300 to 600 kg/ha. The project reports that the food security period has improved to three to six months for a typical household. The increased consumption of protein particularly benefits child health.

Key benefits of case study 9

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	

2.4.10 LOMADEF, Lipangwe, Malawi[61]

In 1993, the challenges of crop productivity far below subsistence levels, soils with deteriorating fertility and escalating prices of essential farm inputs inspired a group of determined Malawian smallholder farmers to provide themselves with hands-on experience with selected organic soil improvement practices. As a result, they established the Lipangwe Organic Manure Demonstration Farm (LOMADEF), a small farm on a steep undulating landscape, with the objectives to demonstrate the benefits of organic agriculture; reduce dependence of smallholder subsistence farmers on artificial fertilizers; nurture a sense of self reliance among farmers and use the demonstration farm for smallholder farmers from all over the country to come and learn about organic agriculture techniques and establish further sustainable agriculture demonstration farms for smallholder farmers.

The first step LOMADEF took was to use manure on the fields. While surrounding farmers suffered wilted and stunted crops, the LOMADEF farm gave very conspicuous results which encouraged more farmers, other agricultural NGOs and the Government to take an interest. Over 1,200 farmers have since been brought in to observe the benefits of organic agriculture and to learn some simple organic agriculture practices. LOMADEF has now grown from one club to thirteen and membership has increased from 13 to 200, with clubs spread across the country. The LOMADEF experience suggests that smallholder-managed demonstration farms that show affordable technologies are very attractive to smallholder farmers.

---

[60] Source: Francisca Mate; James Atema; Questionnaire for University of Essex SAFE Research Database 2001

[61] Source: Kanjanga, 2002.

Key benefits of case study 10

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.11 Organic cashews and vegetables in Mkuranga District, Tanzania[62]

Providing children with good, nutritious food, healthcare, clothing and education is at the forefront of the minds of most mothers, including the women farmers of Mkuranga district, 40 km south of Dar es Salaam, in Tanzania. Since 2004, women from this region have come together and formed groups all associated under the umbrella of 'Muungano'[63] and have been collaborating on organic vegetable production and processing activities with the aim of producing organic vegetables for increased food security and incomes.

Traditionally, farmers in this area have grown rice and cassava, and have been dependent on income from the sale of coconuts, or more recently cashew nuts, to sustain their families. With facilitation from the Sida-funded EPOPA programme, a large Dar es Salaam-based company, Premier Cashews Industry Ltd. (PCI), has converted part of its system to be able to process certified organic cashew nuts providing the opportunity of organic cashew production for export for farmers in Mkurunga. PCI works with 480 farmers in three villages in the district to grow and supply the organic cashew nuts.

However, farming households still remain highly vulnerable to changes in world market prices for cashews (for both the non-organic and organic sector alike) and when combined with the substantial pressures put on their limited household resources by the unreliable climate and repeated droughts of recent years, food security was not always achieved in the region.

The women grow fruits, such as bananas and papaya, and vegetables including amaranths, sweet potatoes, okra, cassava, collard and tomatoes. Farming is carried out through a mixture of traditional and novel practices such as mulching and the use of botanical pesticides. An intimate local knowledge of the area's ecological conditions has been combined with new technologies such as sunken beds and contour planting for soil and water conservation.

The reliance on locally-available natural and social resources and the internalization of organic principles of production into the farming system have improved overall agro-ecosystem sustainability in Mkuranga. Organic vegetable production integrated into the organic system has helped to diversify sources of food and income which is particularly important in an area where historically relatively good prices for non-organic cashews have resulted in neglect of food crops.

The social capital of the region's women has improved. Helping one another financially during difficult periods, such as with school fees and medical expenses, by opening savings accounts was one of the main motivations for the project. Cooperation among women around a common goal has created powerful momentum in the drive for community development. In addition to

62 Source: Petra Bakewell-Stone, 2006.

63 Muungano means "union" in Kiswahili.

vegetables, the local groups are engaged in many other activities such as producing red palm oil, handicrafts (such as grass mat-making and basketry), local chicken-rearing and cassava-milling to make flour for baking cakes and doughnuts. Although these activities used to be carried out individually, the formation of groups has meant that production is more organized, which has also increased access to markets.

So far, the women's groups have been selling at local markets and directly to local schools. Formal certification of organic production is generally of low priority where production levels are low and most of the produce is marketed locally. However, after a visit by the manager of the national certification body, TanCert, the groups have decided to certify their production as organic. Specialist and general stores in Dar es Salaam are increasingly demonstrating their willingness to market fresh and processed organic produce, and large hotels are also emerging as a potential market. The relative proximity to the main national market lends itself well to expansion of trading activities in this area.

While certification could have many advantages, it may not solve all farmers' problems. While there are many opportunities for improving the sustainability of smallholder livelihoods through organic agriculture, these depend upon adequate human and social capital. The introduction of technologies and establishment of market linkages is most effective when combined with a good understanding of organic production and trade and new ways of working together. Organic agriculture that integrates both a production and a community focus gives an opportunity to secure sustainable livelihoods for smallholders in Africa. This can enable them to make more efficient use of available resources within the current institutional context and to build upon existing livelihood strategies. If community organizations, commercial enterprises and other stakeholders were to collaborate on certification procedures, this would bring additional benefits by combining farmer empowerment with production of high quality products for consumers.

Key benefits of case study 11

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

2.4.12 Soil and crop productivity improvements, EAT, Kenya[64]

The Environmental Action Team (EAT) soil and crop productivity enhancement project covers smallholder-farming communities of Trans Nzoia, West Pokot, Lugari and Bungoma districts in North Rift and western regions of Kenya. Here, rainfall reliability is generally high, except in West Pokot District where the climate is marginal. However most of the districts are covered by soils that are inherently low in fertility; it is an area with traditionally low crop productivity (less than two tons/ha for maize and less than 0.1 tons/ha for beans); there is low diversity in the crops that are grown (about 95 per cent of cultivated land covered by the dominant crops of maize and beans); and there is rampant household food insecurity (with an average 3.3 months of hunger experienced every year). The aim of this EAT project is to enhance household food security within the target farming communities through increased crop yields by encouraging soil and crop productivity improvements. EAT carries out training using participatory methodologies

[64] Source: Charles Wasonga, EAT Kenya.

such as field days, demonstrations, farmer verification trials, farmer follow-ups, farmer-to-farmer visits. It encourages the formation of collaborative partnerships and participatory learning and identification. EAT instructs on soil fertility management, crop diversification, improved crop management and improved farm planning.

More than 1,000 farmers drawn from different farming communities have been directly trained through the project and they are integrating components into their farms. Untrained farmers are learning from trained farmers causing a multiplier effect so the number of farmers who have benefited from the project is much higher. Integration of components has resulted in increased maize yields to 3,414 kg/ha (71 per cent increase in productivity), while bean yields have increased to 258 kg/ha (158 per cent increase in productivity) as compared to traditional agriculture. There has also been an increased diversity of crops grown. These results have had broad reaching impacts on food and nutrition security, the natural environment, communities, education and the economy (see Box 6.)

Box 6. Impacts of the soil and crop productivity enhancement project of EAT Kenya

- Increased diversity in food crops available on farms has resulted in more varied diets and thus improved health.
- Surplus produce is sold and income used to access health facilities and medicines.
- There are reduced health risks for farmers because of reduced pesticide use.
- Surplus produce is sold and the resulting income used to pay school fees for farmers' children. Thus education has improved.
- Soil loss from farms has been reduced following implementation of soil conservation techniques.
- Soil health has improved through soil organic matter accumulation following application of organic manures.
- Cohesion within farming communities has been enhanced through forums organized for farmers for sharing ideas and findings on productivity improvement and marketing of farm produce.
- Groups formed during the project's interactions with farmers have evolved into channels for entry into other development interventions within the communities, such as group marketing of farm produce.
- Farmers who have adopted new practices have become teachers for other community members on techniques for improving productivity, and in the process they themselves have gained more respect and social standing within communities and households, which has increased their self esteem.
- More people have gained self-employment in farming and businesses established through finances obtained from sale of surplus farm produce.
- Capacity of individual farmers to evaluate emerging production techniques has increased.
- Households have been financially empowered and have been able to adopt technological advancements such as mobile telephones, which have increased communications and enhanced efficiency in exploitation of market opportunities.
- Unemployment levels within farming communities have fallen leading to an overall reduction in poverty within households.

Source: Charles Wasonga, EAT Kenya, pers. com., 2005.

Key benefits of case study 12

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.13 PEEST project, Iganga district, Uganda[65]

The Poverty Eradication through Environmentally Sustainable Technologies (PEEST) project has been implemented in the Iganga District of Eastern Uganda since June 1997 by Africa 2000 Network. The aim of the project is to combat environmental degradation by promoting ecologically sustainable development for improved livelihoods among the smallholder farmers in the District. Since the 1970s the natural and agro-ecosystems of the area have been suffering degradation following rapid population growth and deterioration in the economic situation. As the population grew, natural forest and woodlands were cleared for agricultural use, fuel wood, timber and human settlements. This mass clearing of forests, woodlands and wetlands has resulted in an increasing scarcity of fuel wood, timber, and drinking water from natural wells and springs which are increasingly drying up at a much faster rate during the dry season

By 1997, many farmers in the Iganga District were faced with a problem of increasing vulnerability characterized by high poverty levels (above the national average of 45 per cent living below the poverty level of one dollar per day) and food insecurity. The three-year PEEST project was initiated with the aim of improving the livelihoods of the smallholder farmers through increased agriculture productivity and sustainable natural resource management. The aims of the project were to: provide knowledge and skills to enable communities to manage their environment and natural resources in a sustainable manner; help communities in the District to improve their food security and diets and to increase their incomes and fuel wood production; ensure active participation of both men and women as a family unit for improved family welfare; and ensure that successful projects and practices are replicated, where conditions permit, and unsuccessful ones avoided.

Partners supporting PEEST include: Cordaid (formally Bilance), International Centre for Research in Agroforestry (ICRAF), Centre for Tropical Agriculture (CIAT), the Tropical Soil Biology and Fertility Programme (TSBF), the Kawanda Agricultural Research Institute (KARI) of the National Agriculture Research Organization (NARO), Makerere University Soil Science Department and Sida's Regional Land Management Unit.

The first phase of the project used participatory methodologies, raised environmental awareness in the community, and equipped farmers with knowledge about their environment and skills to manage their natural and agricultural resources more sustainably. This resulted in improved productivity of natural resources. The technologies and practices which were adapted and adopted reduced soil erosion, conserved soil water, helped prevent soil nutrient loss and improved soil fertility, thus resulting in improved agriculture productivity. By improving soil fertility the demand by participating farmers for more land from forests and wetlands was eliminated. The new agro-forestry technologies increased the supply of fuel wood and fodder and contributed to increasing the fertility of the soils, while the improved cook stove reduced the demand for fuel wood. The promotion of indigenous crop varieties contributed to improving the food security of the community and to the conservation of the local agro-biodiversity. Of the 10,000 farmers reached in the first phase of the project, 99 percent reported increased food supplies and many reported increased income.

However the rapidly growing population of a predominately rural population remains a serious challenge. The project has recognized this problem and is now adding family planning and HIV/AIDS in its interventions. Gender inequity remains a serious limitation to organic agriculture development in Uganda as it affects labour deployment and allocation of resources. The project has mainstreamed gender and instituted incentives like support to families that show a higher degree of gender equity to promote change. Gender equity is a social phenomenon and takes time to take effect in many of the families.

The project is now in its second phase of implementation with the aim of reaching a total of 50,000 households in the District. With many farmers replicating organic farming practices and

[65] Source: Walaga and Kakinda, 2002.

technologies, positive contributions of organic agriculture to the ecosystem of the District are being multiplied. The adoption of sustainable agriculture techniques has also improved the livelihoods of rural farm households. These techniques are particularly suitable to small and resource poor farmers and scaling-up should be facilitated to benefit many more farmers more quickly.

Key benefits of case study 13

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	
Financial capital	• Increased incomes to farmers	√

2.4.14 MOOF, Kenya[66]

Mount Kenya Organic Farm (MOOF) was established in 1999 with a remit to facilitate smallholder producer groups in the production and marketing of high-value certified organic products. The primary objective is to improve and help to raise the living standards of Kenya's smallholder farmers by having an assured food security for themselves and their communities, to tackle poverty and to empower the local community through the production of speciality high-value organic crops for local and export markets.

The MOOF farm demonstration garden consists of 0.25 acres and is made up of a number of raised beds growing 14 vegetable types. During the 2000–2002 drought, vegetables in the demonstration garden fared well compared to others in surrounding gardens. Pest control included the use of natural predators, and plant extracts, neem and garlic sprays. MOOF has already developed a local network of self-help smallholder groups which it services with training and advice on organic farming techniques. Farmers trained by MOOF have adopted organic methods such as soil management practices (which help to retain moisture) and have had a greater success with crops. 925 farmers visited MOOF organic gardens and 300 farmers adopted at least one organic technique in food production

MOOF has recently started the organic borage for export project, which is currently supported by USAID Development Agency through Fintrac's Kenya Horticulture Development Centre and Earthoil. The Project targets production of certified organic borage seeds for cold pressing into neutraceutical oil for export to Europe and the United States of America. This has contributed immensely in building up the rural economy in the project area. This organic agriculture is labour intensive and has contributed to large number of people getting employed in the sub-sector. Borage seeds fetch good farm gate price at $ 4.00 per kilogram which has been negotiated and agreed upon between the buyer, Earthoil Kenya Limited, and the farmers self-help groups . Borage yields are estimated at 500–750 kg per acre and the cost of production is very minimal compared to conventional agricultural technologies. Income generated from the 30 acres of borage of this project in 2006 is estimated at Kshs. 4.5 Million ($ 64,000) coming into the Nanyuki community (80 smallholder farmers) over a period of seven months.

It is hoped that income generated from this project will enable people to have access to better health facilities, to afford a family bicycle and to enjoy improved nutritional status from stocking Tilapia fish for consumption. It is hoped that income generated from sale of organic oil crops

[66] Source: Peter Murage, 2006.

will provide money needed for the household basic needs and hence reduce encroachment to Mt. Kenya forest for charcoal burning and the felling of indigenous trees for timber and fencing posts. As borage attracts bees in large numbers, it is hoped that farmers will engage in production of organic honey which, when marketing is well-organized, will fetch good prices and supplement their borage income.

Key benefits of case study 14

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	√
Natural capital	• Benefits to natural environment – soils, water, fertility etc	√
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

2.4.15 PELUM, Tanzania[67]

Participatory Ecological Land Use Management-Tanzania (PELUM Tanzania), is a network of civil society organizations working with rural communities in promoting sustainable agriculture in Tanzania. PELUM Tanzania is one of the ten Country Working Groups (CWGs) in East, Central and Southern Africa that form the PELUM Association. The association was launched in 1995 and its headquarters are in Lusaka, Zambia. PELUM also has CWGs in Kenya and Uganda. Currently PELUM Tanzania has 33 member organizations that have come together to facilitate learning, networking and advocacy in participatory ecological land use management. As a network of CSOs, PELUM Tanzania does not work directly with smallholder farmers, but works through its members that work with rural communities in Tanzania.

The objectives of PELUM Tanzania are to develop capacity of member organizations through training workshops; facilitate networking through farmer organizations; be a tool for documentation and communication; facilitate advocacy work in food and seed security and sustainable land use management; advocate issues of marketing and trade; and develop PELUM Tanzania membership functioning, assessment and visibility. PELUM Tanzania works with and for smallholder farmers to tackle food security issues by advocating participatory policy formulation; access to markets; seed security, improved rural infrastructure (roads, storage facilities, physical markets, communication, etc.) and allocation of 10 per cent of the national budget to agriculture and food security by 2010. PELUM Tanzania also organizes farmer exchange visits and networking days so that farmers can learn and exchange best practices. During networking days, farmers' groups and networks come together to exhibit their products and to share experiences and skills in production, processing, storage and marketing of agricultural products.

In 2003, four field staff from PELUM Tanzania participated in a two weeks workshop on organic farming and marketing organized by the PELUM Association to introduce member organizations to the potential of organic farming in Tanzania. After this workshop, some members have started strategies for introducing organic farming in their areas. PELUM Tanzania also made it possible for its member organizations and farmers to meet with and learn from organic farming institutions in Tanzania, such as EPOPA (Export Promotion of Organic Products from Africa), TOAM (Tanzania Organic Agriculture Movement) and TanCert (Tanzania Organic Certification Association).

[67] Source: Donati Alex Senzia, PELUM Tanzania, 2006.

Key benefits of case study 15

Improvement to:	Mechanism:	
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	not reported
Natural capital	• Benefits to natural environment – soils, water, fertility etc	
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	√
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	√
Physical capital	• Improvements to infrastructure and markets	√
Financial capital	• Increased incomes to farmers	√

2.4.16 Discussion of evidence

Evidence from both the secondary sources and the case studies summarized in this report reinforces the view that food security is influenced by many different factors that vary from region to region and although an increase in yields is a fundamental factor, this alone cannot guarantee a reduction in food insecurity. Other factors such as improvements to the natural, social and human capital assets base that organic agriculture provide together with increased farmer incomes are also significant and can often be seen as measures of success in reducing food insecurity.

To illustrate this more clearly the key improvements resulting from each of the case studies detailed in this research have been analysed. These are summarized in box 7.

Box 7. Key improvements shown by case studies

Improvement to:	Mechanism:	Number of case studies which showed improvement (out of a possible 15)	Per cent
Amount of available food	• Increase in food produced • Increase in yields of food crops/ livestock	**12**	**80 (92)[a]**
Natural capital	• Benefits to natural environment – soils, water, fertility etc	**14**	**93**
Social capital	• Builds partnerships between groups • Increased community cohesion and cooperation	**14**	**93**
Human capital	• Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community	**15**	**100**
Physical capital	• Improvements to infrastructure and markets	**6**	**40**
Financial capital	• Increased incomes to farmers	**13**	**87**

[a] For two of the case studies examined (organic cotton in Uganda and Tanzania) increasing food production was not part of the remit, as such, in project objectives. If only those 13 case studies which were centred on food production were considered, the percentage would be 92 per cent. One case study did not provide data on food availability.

- **Increase in food availability**

Food availability increased in all the case studies focused on food production where data were reported, either in terms of increased yields of crops and livestock productivity or an increase in

total food produced.[68] For example, the 500 farmers on some 1,000 hectares participating in the Community Mobilization Against Desertification (C-MAD) programme in Kenya have seen a doubling of maize yields – increasing from about 2 to 4 t/ha.

Evidence from this study and others shows that agricultural yields in organic systems tend to be stable when converting from low-input systems (those that may have been by-passed by the "green revolution"). Over time, yields increase as capital assets in systems improve, thus outperforming those in traditional systems and matching those in more conventional input-intensive systems.

- **Benefits to the natural environment**

The vast majority of the case studies in this research showed improvements to the natural capital base – their local natural environment – with 93 per cent of the case studies reporting benefits to soil fertility, water supply, flood control and biodiversity. For example, the PEEST programme in Uganda resulted in improved productivity of natural resources. The organic technologies and practices, which were adapted and adopted, reduced soil erosion, conserved soil water, helped prevent soil nutrient loss, and improved soil fertility, thus resulting in improved agriculture productivity. By improving soil fertility the demand by participating farmers for more land from forests and wetlands was eliminated.

- **Benefits to community, cooperation and partnerships**

Again, 14 out of the 15 case studies (93 per cent) cited improvements to social capital as integral to their success. The formation of farmers' groups and cooperatives and less formal community collaboration has lowered the costs of working, led to increased knowledge transfer amongst farmers, reduced the costs of organic certification and contributed to greater food security. Women from the Mkuranga District of Tanzania, for example, have been collaborating on organic vegetable production and processing activities with the aim of producing organic vegetables for increased food security and incomes. They have come together and formed groups associated under the umbrella of 'Muungano'. Helping one another financially during difficult periods was one of the main motivations for the project. Cooperation among women around a common goal has created powerful momentum in the drive for community development.

The 1,000 farmers trained under the EAT project in Kenya have in turn become teachers for other community members on techniques for improving productivity, thus multiplying the project's impact. Cohesion within farming communities has been enhanced through forums organized for farmers for sharing ideas and findings. Groups formed during the project's interactions with farmers have evolved into channels for entry into other development interventions within the communities, such as group marketing of farm produce.

- **Increase in education, skills and health**

All of the case studies detailed in this report have reported on improvements in human capital. All have some element of education that increases the knowledge of organic farming methods and the skills of farmers. In many cases there have been direct improvements in the health of individuals and communities as a result of increased knowledge, an increase in food yields and improved access to food. The ability of farmers to use their better understanding of the holistic nature of organic farming to adapt and change their farming systems when faced with new challenges has resulted in these agricultural systems becoming more resilient to environmental and external stresses.

The case studies demonstrated multi-faceted health benefits associated with a switch to organic farming. For example, the EAT project in Kenya reported improvements in farmers' health because: the health risks associated with synthetic agro-chemicals were reduced or eliminated with the

[68] See footnote in box 7.

switch to organic farming; the increased diversity in food crops resulted in more varied diets and increased nutritional security; the increased income enhanced ability to access healthcare. The C-MAD project in Kenya reported reduced child mortality in the project area.

- **Improvements to infrastructure and markets**

Of the case studies examined, 40 per cent reported improvements in the physical infrastructure and in market access. Access to markets has increased not only for farmers selling their surplus in domestic markets, but also for farmers selling their certified organic produce in international markets.

- **Increase in farmer and household incomes**

Of the case studies, 87 per cent showed increases in farmer and household incomes as a result of becoming organic, which contributed to reducing poverty levels and to increasing regional food security. For example, after adopting organic norms and practices, the incomes of farmers from SACDEP in Thika, Kenya increased 40 per cent. This enabled them to meet basic needs such as paying school fees and medical expenses. Additional savings for organic farmers accrue as a result of no longer needing to purchase synthetic fertilizers and pesticides.

- **Summary**

A study in 2002 comparing organic initiatives to other sustainable but not organic projects[69] drew a number of conclusions that are also reflected in the case studies of this research. In addition to the increases in available food, organic systems are beneficial because they are more integrated than average farms; they tend to use a larger number of the improvement mechanisms and focus on intensifying microenvironments on farms and diversifying by adding new regenerative components to the system. A large proportion of organic and near-organic systems focus on social capital building through groups and 97 per cent of cases in the 2002 study and 100 per cent in this study have a human capital development element. Adding value through direct links to markets and consumers has also been shown to be an important development in the success of organic systems.

2.5 Limitations and challenges to the spread of organic agriculture in Africa

2.5.1 Knowledge

Although many resource-conserving technologies and practices are currently being used in Africa, the total number of farmers using them is still relatively small. Lack of knowledge of organic and sustainable agricultural techniques is often a limiting factor in the spread of organic production.

Farming systems become more productive when human capital increases, particularly in the form of the capacity of farmers to innovate and adapt their farm systems. Sustainable organic agriculture is not a defined set of particular technologies. Lack of information on agro-ecology and the necessary skills to manage diverse farming systems can be a major barrier to the adoption of organic agriculture.[70]

Adoption of new technologies is also not a costless process for some farmers as often they cannot simply cut their existing use of fertilizer or pesticides and hope to maintain outputs immediately, thus making operations more profitable. However this may be offset to a certain extent by the savings incurred as a result of no longer having to buy expensive, synthetic pesticides and fertilizers.

One of the reasons that these transition costs arise is that farmers must first invest in learning. As

[69] Pretty, 2002.
[70] Pretty and Ward, 2001; Röling and Wagemakers, 1997; Pretty, 2002.

recent and current agricultural policies have tended to promote specialized, non-adaptive systems with a lower innovation capacity, farmers then have to spend time learning about a greater diversity of practices and measures. Lack of information and system management skills can therefore be a major barrier to the adoption of organic agriculture. During the transition period, farmers must experiment more, and so incur the costs of making mistakes as well as those of acquiring new knowledge and information.[71]

In addition, lack of knowledge and information about organic agriculture among government officials and other influential actors in educational and research institutions results in limited appreciation of the potential that organic and near-organic agriculture offers for tackling poverty eradication and food security issues.

2.5.2 Support and infrastructure

The difficulties in disseminating information in remote and marginal rural areas in Africa can also be a limiting factor to the spread of organic production. One of the greatest constraints faced by farmers changing to organic and near-organic systems is the lack of knowledge, information sources, and technical support. Greater government investment in appropriate research and extension services would help overcome these constraints.[72]

Africa is starting to benefit from organic market opportunities but at the moment large certified producers and operators may find it easier to access international markets than the smaller-scale farm enterprise. Where smaller farmers are (i) organized into farmer groups and are being supported by organizations including KOAN, NOGAMU and TOAM or (ii) where the commercial exporters meet certification costs, they are able to access markets more easily, but for some the costs of certification systems and complying with international standards may also be prohibitive.[73]

Another factor affecting farmers wanting to take advantage of the organic export market is the limited infrastructure in Africa. Many companies who specialize in organic produce for the overseas export market often expect large quantities of organic produce at once. When considering that much of the certified organic produce in African countries may be grown by a cooperative group of small farmers, the logistics required to ensure that produce leaves from many different farms yet reaches the destination on time (with transport infrastructure often very limited or inconsistent) and in perfect condition (with limited and inconsistent refrigeration facilities available) are very challenging. In order for farmers from Africa to compete in international organic markets significant investment into supporting infrastructure is essential.

The general lack of large domestic organic markets in Africa may seem to make commercial organic agriculture a high risk venture as it relies solely on the export market.[74] The more a production system – organic or non-organic – resembles monocropping, the greater is its vulnerability. Recently however, domestic organic markets are starting to flourish in some African countries, particularly in East Africa, South Africa and North Africa. Moreover, monocropping on organic farms is not common in Africa. Smallholder organic farmers in Africa often export one certified organic cash-crop but also produce a variety of others for their own consumption and local sales.

Lack of financial resources may also limit the spread of organic agriculture in Africa. Many farmers are small-scale, poor and lack the financial resources to enable them to start the transition to organic agriculture. Conversely many farmers make the transition to organic precisely because of their lack of finances to purchase synthetic fertilizers and pesticides.

---

71 Orr, 1992; Röling and Wagermakers, 1998; Bentley et al., 2003; Lieblin et al., 2004; Bawden, 2005; Chambers, 2005; Gallagher et al., 2005.

72 Altieri, 2002.

73 Wynen and Vanzetti, 2002; Rundgren, 2007.

74 Walaga, 2005.

Development agents and NGOs involved in implementation of organic support programs within the farming communities also may lack the financial resources to facilitate organic production and to venture towards the export market, as there is also the problem of limited and uncertain funding.

2.5.3 Winners and losers

In some contexts where organic agriculture is being adopted, there will also be critical trade-offs that may limit the spread and potential to scale-up. The use of one asset for improvements can result in the depletion of another (e.g. building a road to improve marketing near a forest can aid illegal timber extraction). In some cases, progress in one component of a farm system may cause secondary problems, such as increased yields leading to increased offtake of nutrients, which may need to be supplied from external sources.[75]

There will also be new winners and losers with the wider adoption of organic agricultural systems. This model for farming systems implies a very limited role for current agro-chemical products, the producers of which are unlikely to accept market losses lightly.

2.5.4 Gender, health, employment and land tenure issues

In some cases organic farming systems may increase the household workload and the burden may particularly fall on women if the cropping intensity of the farm increases or new lands are taken into cultivation. However with the exception of vegetables, additional incomes arising from sales of produce, particularly coffee and cotton for export, may go directly to the men, who are less likely than women to invest in the children and the household as a whole. Farmers are also sometimes hesitant to adopt more labour intensive farming methods sometimes associated with organic agriculture, particularly if they are to be used with crops they consider as low value.

Sustainable livelihoods based on organic agricultural production may appear to be keeping people in rural areas away from centres of power, and 'modern' society when the aspirations of some rural people may precisely be to gain sufficient resources to leave rural areas. The poor health of the farming workforce in some areas due to disease, HIV /AIDS and malnutrition will also affect and reduce the productivity of labour in some areas of Africa.

Whilst a whole systems organic farming approach advocates an integrated system featuring both crops and livestock, some of the communities in Africa are traditionally pastoral and sometimes crop-livestock conflicts can occur.

Organic agriculture that increases the assets base and so the value and potential of the land may also increase the incentives for more powerful interests to take over, such as landlords taking back formerly degraded land from tenants who had adopted soil-improving methods. Conversely, tenant farmers may also be reluctant to spend any initial outlay on improvements to someone else's land.

2.5.5 External factors

External factors that limit the spread of organic and non-organic farming alike in Africa are largely the same as those external factors that contribute to and exacerbate food insecurity (see section 1.4). Misperceptions may also play a limiting role, including for example the misperception that organic agricultural practices would not be able to address the high incidence of pest and diseases incidences on some species and in some areas. Some African Governments may find themselves under political or economic pressure to promote industrial agro-chemical-based agriculture and the introduction of genetically modifed organisms (GMOs) instead of sustainable agriculture based on locally-available resources.

---

[75] Smaling et al., 1997.

2.5.6 Participatory development policies for organic agriculture

Much less is known about organic resource-conserving technologies than is known about the use of external inputs in modernized agricultural systems. It is clear that the process by which farmers learn about alternative ways of farming is crucial. If alternatives are enforced or coerced, then farmers may only adopt them for a limited period. But if the process is participatory and enhances farmers' capacity to learn about their farm and its resources, then the foundation for change and continuous innovation is laid.[76]

The findings from this report suggest that the technical improvements leading to natural capital accumulation are being widely applied with organic agriculture development. A focus on social capital and institutional development is needed to continue to build resilience and innovation capacity within communities and to facilitate the spread of good practice in organic agriculture.[77]

As indicated earlier in this paper, agricultural sustainability can contribute to increased food production, as well as make a positive impact on the environment, society and individuals. Clearly much can and is being done with existing resources, but a wider transition towards organic agriculture will not occur without some external support and money. As the evidence shows it costs time and money to rebuild depleted natural and social capital and also there are costs in developing new or adapting old technologies.

Most agricultural sustainability improvements worldwide occurring in the 1990s and early 2000s appear to have arisen despite existing national and institutional policies, rather than because of them. The lack of enabling policies, particularly those aimed at fostering growth of the organic sector in areas of research and development and markets, has been a major obstacle to the spread of organic farming. The tendency of Governments has been to create programmes designed to draw small farm agriculture into (high-input) technology and higher-value crops especially for export markets, on the assumption that they will become more productive and competitive. This has been the case in East Africa. Policies designed to deliver increased food production will have to be changed and be developed with full stakeholder consultation if they are to help deliver environmental and social benefits too. Rural development policies, which focus on `exogenous' solutions to the economic and social problems of rural neighbourhoods, are ill-suited to the needs of the community and to participatory development.[78]

These conclusions are confirmed by the findings and recommendations of the recently released report of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) panel, an intergovernmental process, supported by over 400 experts under the co-sponsorship of the FAO, GEF, UNDP, UNEP, UNESCO, the World Bank and WHO, issued on 14 April 2008. It stated strongly that "the way the world grows its food will have to change radically to better serve the poor and hungry if the world is to cope with growing population and climate change while avoiding social breakdown and environmental collapse." The authors found that (i) progress in agriculture has reaped very unequal benefits and has come at a high social and environmental cost; and (ii) food producers should try using "natural processes" like crop rotation and use of organic fertilizers. The authors call for more attention to small-scale farmers and utilizing sustainable agricultural practices, and specifically mention organic farming as an option several times.[79]

Although the Government of almost every country would now say it supports the idea of agricultural sustainability, the evidence points towards only limited, albeit increasing, reforms. Government policies and budgetary resources devoted to supporting sustainable agriculture, including organic agriculture, are still dwarfed by the resources devoted to supporting agro-industrial conventional

---

[76] Bunch and Lòpez, 1996.
[77] Pretty, 2002.
[78] Dasgupta, 1998; Altieri, 2002.
[79] IAASTD, 2008.

agriculture. Hardly any African country has included organic farming in its main agricultural policies and many policies still support input-based, non-organic agriculture. However Tunisia has an organic agriculture policy in place and Kenya's catchment approach to soil conservation is evidence of reform of parts of its agricultural policy[80] and in Kenya, Tanzania, Uganda, Rwanda and South Africa there is reportedly new interest from policy-makers to develop policies supportive of organic agriculture.[81]

More importantly, an export-led approach to organic agriculture can ignore the in-country opportunities for agricultural development focused on local and regional markets. Agricultural policies with the threefold aims of food security, sustainability and poverty-reduction should therefore contain strands that emphasize both small farmer development linked to local markets, and agri-business enhancement that develops both small and large businesses and focuses on export-led, agro-processing and value-added activities.

The recently released CBTF publication on best practices for organic policy (what developing coutries can do to promote the organic agriculture sector) contains valuable analysis and guidance in this regard.[82]

[80] Funes et al., 2002; Pretty, 2002; Herzog et al., 2005.
[81] UNCTAD, UNEP, IFOAM, et al., 2007.
[82] UNCTAD-UNEP, 2008.

SECTION 3. CONCLUSIONS

- Organic agriculture can increase agricultural productivity and can raise incomes with low-cost, locally available and appropriate technologies, without causing environmental damage. Furthermore, evidence shows that organic agriculture can build up natural resources, strengthen communities and improve human capacity, thus improving food security by addressing many different causal factors simultaneously.

- All case studies which focused on food production in this research where data have been reported have shown increases in per hectare productivity of food crops, which challenges the popular myth that organic agriculture cannot increase agricultural productivity. Organic production allows access to markets and food for farmers, enabling them to obtain premium prices for their produce (export and domestic) and to use the additional incomes earned to buy extra foodstuffs, education and/or health care. A transition to integrated organic agriculture, delivering greater benefits at the scale occurring in these projects, has been shown to increase access to food in a variety of ways: by increasing yields, increasing total on-farm productivity, enabling farmers to use their higher earnings from export to buy food, and, as a result of higher on-farm yields, enabling the wider community to buy organic food at local markets.

- Organic and near-organic agricultural methods and technologies are ideally suited for many poor, marginalized smallholder farmers in Africa, as they require minimal or no external inputs, use locally and naturally available materials to produce high-quality products, and encourage a whole systemic approach to farming that is more diverse and resistant to stress.

- The recent food-price hike and the contribution rising fuel prices have made to it highlight the importance of making agriculture less energy and external input dependent. Enhanced transition to sustainable forms of agriculture in general, and organic agriculture in particular, needs to be part of an effective response strategy to escalating food prices.

- Certified organic production for the export market, with its premium prices, can undoubtedly reduce poverty among farmers, which is a major contributor to food insecurity. However, monocropping farming systems for the export market, whether conventional or organic, still leave farmers vulnerable to export price fluctuations and crop failure. Where organic farming principles are adopted as a holistic approach for the whole of an integrated agricultural system, "organic" can be synonymous with "sustainable", and increased food security in a region is more likely to occur, while also building up natural, human and social resources.

- Organic agricultural systems are making a significant contribution to the reduction of food insecurity and poverty in areas of Africa, and to an improvement in rural livelihoods. There is the potential to do more in this area with enabling policy and institutional support.

- Organic agriculture is not directly and specifically supported by agricultural policy in most African coutries; indeed, it is sometimes actively hindered by policies advocating the use of high-input farming management practices. If organic agriculture and its associated positive side-effects are to be scaled up, an enabling policy environment is critical.

- Integrated organic agriculture, whether certified or non-certified, is more management-

and knowledge-intensive, and so necessitates building the learning and cooperative capacity of individuals and groups. This requires investment in developing the social capital at the local level if organic agriculture is to spread.

- Much more is now known about intensive, high-input farming systems than is known about sustainable organic systems. Thus more information on agro-ecological technologies is needed. However this calls for a shift of emphasis in research and science budgets, and for the creation of better linkages between scientists, agricultural training and extension providers and farmers.

- Partnerships between farmers, farmer groups, NGOs and CSOs, organic movement organizations, governments and certifying bodies at all levels foster successful organic agriculture. In order to facilitate the spread of organic agriculture there is a need to work at all levels: local national and international, as well as to encourage more links between governments, NGOs and the private sector.

- Improving agricultural sustainability through adoption of organic agriculture in Africa may not be a solution to all the food problems, but considerable progress has been made in recent years. Whether organic farming will result in enough food to meet current and future needs in response to continued population growth and development in African countries can never be totally certain, but is certainly a step in the right direction. The present situation of widespread food insecurity means that conventional farming systems are clearly unable to fulfil the current food needs in Africa. The results observed in the transition to organic agriculture are highly promising for food security in Africa. Evidence indicates that productivity in organic agriculture can grow over time.[83] With further specific support, the benefits to food security and related improvements to natural, social and human capital, could spread to much larger numbers of farmers and rural people in the coming decades.

[83] Borlaug, 1994a and 1994b; Avery, 1995.

References

Altieri M A. 1995. *Agroecology: The Science of Sustainable Agriculture.* Westview Press.

Altieri M A. 2002. Non-certified agriculture in developing countries in Sciallaba N El H and Hattam C. 2002. *Organic Agriculture, Environment and Food Security.* FAO, Rome.

Avery D. 1995. *Saving the Planet with Pesticides and Plastic.* The Hudson Institute, Indianapolis

Atema J. 2005. Personal communication.

Bakewell-Stone P. 2006. Organising for organic agriculture in Tanzania. *LEISA Magazine* 22.2. June 2006.

Balfour E B. 1943. *The Living Soil*. Faber and Faber, London.

Bawden R. 2005. The Hawkesbury experience: tales from a road less travelled. In Pretty J (ed). *The Earthscan Reader in Sustainable Agriculture*. Earthscan.

Benson T. 2004. Africa's food and nutrition security situation: Where are we and how did we get here? 2020 Discussion Paper No. 37. IFPRI Washington DC.

Bentley J W, Boa E, van Mele P, Almanza J, Vasquez D and Eguino S. 2003. Going public: a new extension method. *Int J Agric Sustainability*1(2), 108-123.

Bolwig S, Odeke M and Gibbon P. 2007. *Household food security effects of certified organic production in tropical Africa: a gendered analysis.* EPOPA.

Borlaug, N. 1994a. Agricultural research for sustainable development. Testimony before US House of Representatives Committee on Agriculture, March 1, 1994.

Borlaug, N. 1994b. Chemical fertilizer `essential'. Letter to *International Agricultural Development* (Nov-Dec), p23.

Bouagnimbeck, H. 2008. Organic farming in Africa. In Willer, H, Yussefi-Menzler M and Sorensen N (eds.) 2008. The world of organic agriculture: Statistics and emerging trends 2008. IFOAM (Bonn) and FiBL (Frick).

Brummet R. 2000. Integrated aquaculture in Sub-Saharan Africa. *Environ. Develop. and Sustainability* 1 (3-4), 315-321.

Bunch R and López G. 1996. Soil recuperation in Central America: sustaining innovation after intervention. *Gatekeeper Series SA 55*, Sustainable Agriculture Programme, International Institute for Environment and Development, London.

Bunch R and Lopez G. 1999. Soil recuperation in Central America. In Hinchcliffe F, Thompson J, Pretty J N, Guijt I and Shah P. (eds). 1999. *Fertile Ground: The Impact of Participatory Watershed Management.* Intermediate Technology Publ, London, pp 32-41.

Bunch R. 2000. More productivity with fewer external inputs. *Environ., Develop., and Sustainability* 1 (3-4), 219-233.

Byerlee D. 1998. Knowledge-intensive crop management technologies: concepts, impacts and prospects in Asian agriculture. In Pingali P and Hossain M (eds). *Impacts of Rice Research*. IRRI, Manila.

Caporali F, Mancinelli R and Campiglia E. 2003. Indicators of cropping system diversity in organic and conventional farms in Italy. International Journal of Agricultural Sustainability 1 (1), 67-72.

Carney D. 1998. *Sustainable Rural Livelihoods*. Department for International Development, London.

Carson R. 1963. *Silent Spring*. Penguin Books, Harmondsworth.

Chambers R, Pacey A and Thrupp L A (eds). 1989. *Farmer First: Farmer Innovation and Agricultural Research*. IT Publ, London.

CIIFAD. 2002. *Rice intensification.* Cornel International Institute for Food, Agriculture and Development. (available at http://ciifad.cornell.edu/sri/sriar.pdf).

Clements D and Shrestha A. 2004. *New Dimensions in Agroecology*. Food Products Press, Binghampton, NY.

Coleman J. 1988. Social capital and the creation of human capital. *American Journal of Sociology* 94, supplement S95-S120.

Conway G R and Pretty J N. 1991. *Unwelcome Harvest: Agriculture and Pollution.* Earthscan, London.

Conway G R. 1997. *The Doubly Green Revolution*. Penguin, London.

Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neil R V, Paruelo J, Raskin R G, Sutton P and van den Belt M. 1997, 1999. The value of the world's ecosystem services and natural capital. *Nature* 387, 253-260.

Cox T S, Picone C and Jackson W. 2004. Research priorities in natural systems agriculture. In Clements D and Shrestha A. 2004. *New Dimensions in Agroecology*. Food Products Press, Binghampton, NY.

Cramb R A and Culasero Z. 2003. Landcare and livelihoods: the promotion and adoption of conservation farming systems in the Philippine uplands. *Int J Agric Sustainability* 1(2), 141-154.

Crissman, C.C. Antle, J.M.; Capalbo, S.M. (eds.) 1998. *Economic, Environmental and Health Tradeoffs in Agriculture*. CIP, Lima & Kluwer: Boston.

Dasgupta P. 1998. The economics of food. In *Feeding the World Population of More Than Eight Billion People*, eds Waterlow J.C.; Armstrong D.G.; Fowden L.; Riley R. Oxford University Press: New York and Oxford.

Delgado, C.; Rosegrant, M.; Steinfield, H.; Ehui, S.; Courbois, C. 1999. *Livestock to 2020: the next food revolution.* IFPRI: Washington DC.

EAC. 2007. East African organic products standard. (EAS 456:2007). East African Community. Arusha, Tanzania. Available on the UNEP-UNCTAD CBTF website at www.unep-unctad.org/cbtf.

Ellis F. 2000. *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press, Oxford.

EM-DAT. 2005. The OFDA/CRED International Disaster Database. Centre for Research on the Epidemiology of Disasters. Brussels. http://www.em-dat.net/disasters/trends.htm.

FAO. 2002. Food is the first medicine for AIDS. At http://www.fao.english/newsroom/news/2002/11580-en.html.

FAO. 1996. World Food Summit of the United Nations Food and Agriculture Organization (FAO), Rome.

FAO. 2005. *The state of food insecurity in the world.* FAO Rome.

FAO. FAOSTAT database. Rome, 2005.

FAO/WHO Codex Alimentarius Commission. 2001. Guidelines for the production, processing, labelling and marketing of organically produced foods. CAC/GL 32-1999-Rev.1-2001. Rome.

Fawzi WW, Msamanga GI, Spiegelman D, Wei , Kapiga S, Villamor E, Mwakagile D, Mugus F, Hertzmark E, Essex M and Hunter DJ. 2004. A Randomized Trial of Multivitamin Supplements and HIV Disease Progression and Mortality. *N.Engl.J. MED 351:23-32.*

Federal Democratic Republic of Ethiopia Coffee and Tea Authority. 1999. *Ethiopia: cradle of the wonder bean* Coffee arabica (*abissinica*). Addis Ababa, Ethiopia.

FiBL. 2000. *Organic Farming Enhances Soil Fertility and Biodiversity. Results from a 21 year field trial*. FiBL Dossier 1 (August). Research Institute of Organic Agriculture (FiBL), Zurich.

Flora CB and Flora J L. 1996. Creating social capital. In Vitek W and Jackson W (eds). *Rooted in the Land: Essays on Community and Place*. Yale University Press, Haven and London, pp 217-225.

Gallagher K, Ooi P, Mew T, Borromeo E, Kenmore P and Ketelaar J-W. 2005. Ecological basis for low-toxicity integrated pest management (IPM) in rice and vegetables. In Pretty J (ed). 2004. *The Pesticide Detox*. Earthscan, London.

Gama J, TOAM, Tanzania. 2006 personal communication.

Gibbon P and Bolwig S. 2007. *The economics of certified organic farming in tropical Africa: A preliminary analysis*. SIDA DIIS Working Papper no 2007/3, Subseries on Standards and Agro-Food-Exports (SAFE) No. 7.

Gillespie, S. and L.J. Haddad. 2001. *Attacking the double burden of malnutrition in Asia and the Pacific.* International Food Policy Research Institute, Washington, D.C.

Gliessman S R. 2004. Integrating agroecological processes into cropping systems research. In Clements D and Shrestha A. 2004. *New Dimensions in Agroecology*. Food Products Press, Binghampton, NY.

Gliessman S R. 2005. Agroecology and agroecosystems. In Pretty J (ed). *The Earthscan Reader in Sustainable Agriculture*. Earthscan, London.

Grolink. 2006. Website http://www.grolink.se/Resources/OrgAgr/extentOA.htm.

Herren H. 2003. Personal communication.

Hinchcliffe F, Thompson J, Pretty J, Guijt I and Shah P (eds). 1999. *Fertile Ground: The Impacts of*

Participatory Watershed Development. IT Publications, London.

IAASTD. 2008 Executive Summary of the Synthesis Report of the International Assesssment of Agricultural Knowledge, Science and Technology for Development, Johannesburg, April 2008. Available at: http://www.agassessment.org/index.cfm?page=About_IAASTD&ItemID=2.

IFOAM. 2002. International Federation of Organic Agriculture Movements Basic Standards for Organic Production and Processing. Tholey-Theley, Germany.

IFOAM. 2006a. Website http://www.ifoam.org/about_ifoam/membership/.

IFOAM. 2006b. Website http://www.ifoam.org/about_ifoam/principles/index.html.

IFOAM. 2006c. Website http://www.ifoam.org/organic_facts/food/.

IFOAM.2007. Organic Markets in Africa. (authored by Gunnar Rundgren and Peter Lustig). Bonn.

International Trade Centre (ITC) (UNCTAD/WTO) 2007. Overview of organic agriculture in Rwanda and options for policy and trade development. Draft. Available at http://www.intracen.org/organics/publications.htm.

ITC/KIOF. 1998. *On-farm agro-economic comparison of organic and conventional techniques in high and medium potential areas.* Leusden, Netherlands/Nairobi, Kenya, ITC-Netherlands and Kenya Institute of Organic Farming.

Jackson D L and Jackson D L. 2002. *The Farm as Natural Habitat*. Island Press, Washington DC.

Jama D. 2006 Personal communication.

Kanjanga JJ. 2002. Malawi: the problems and LOMADEF, an encouraging example of a solution. *Ecology and Farming.* 29: 23-24.

Khan Z R, Pickett J A, van den Berg J and Woodcock C M. 2000. Exploiting chemical ecology and species diversity: stem borer and Striga control for maize in Africa. *Pest Management Science* 56 (1), 1-6.

Kiarii E, KOAN, Kenya. 2006. Personal communication.

Lampkin N H and Padel S (eds). 1994. *The Economics of Organic Farming. An International Perspective.* CAB International, Wallingford.

Khan Z R. ICIPE, Kenya. 2006. Personal communication.

Lampkin N and Midmore P. 2000. Changing fortunes for organic farming in Europe: policies and prospects. Paper for Agricultural Economics Society Annual Conference, Manchester, UK.

Lee D. 2005. The adoption of low-external input sustainable agriculture in developing countries. AAEA.

Leeuwis C. 2004. *Communication for Rural Innovation*. Blackwell Publishing, Oxford.

Li Wenhua. 2001. *Agro-Ecological Farming Systems in China.* Man and the Biosphere Series Volume 26. UNESCO, Paris.

Lieblin G, Østergaard E and Francis C. 2004. Becoming an agroecologist through action education. *Int J Agric Sustainability* 2(3), 147-153.

Mate F. 2005 Personal communication.

MA (Millennium Ecosystem Assessment). 2005. *Ecosystems and Well-Being*. Island Press, Washington DC.

McNeely J A and Scherr S J. 2001. *Common Ground, Common Future. How ecoagriculture can help feed the world and save wild biodiversity*. IUCN and Future Harvest, Geneva.

McNeely J A and Scherr S J. 2003. *Ecoagriculture.* Island Press, Washington DC.

Messer E and MJ Cohen. 2004. Breaking the links between conflict and hunger in Africa. 2020 Africa Conference Brief No. 10. IFPRI Washington DC.

Micronutrient Initiative and UNICEF. 2005. *Vitamin and Mineral Deficiency: A global progress report*. Ottowa and New York.

Morison J, Hine R and Pretty J. 2005. Survey and Analysis of Labour on Organic Farming in the UK and Republic of Ireland. *International Journal of Agricultural Sustainability* 3(1), 24-43.

Murage P, MOOF Kenya. 2006. Personal communication.

Muwanga M, NOGAMU, Uganda. 2006 Personal communication.

Nalaga and Kakinda. 2002 Personal communication.

National Research Council. 2000. *Our Common Journey*. National Academy Press: Washington DC.

Ngugi Mutura J, SADCEP. 2005. Personal communication.

Njoroge J W. KIOF, Kenya. 2006. Personal communication.

NOGAMU. 2008. Website: http://www.nogamu.org.ug/newcms/index.php?page=nog_oau.

Norse D, Li Ji and Zhang Zheng. 2000. *Environmental Costs of Rice Production in China: Lessons from Hunan and Hubei*. Aileen Press, Bethesda.

NRC. 2000. *Our Common Journey: Transition towards sustainability*. Board on Sustainable development, Policy Division, National Research Council. National Academy Press, Washington DC.

Nuffield Council on Bioethics. 2004. *The Use of Genetically Modified Crops in Developing Countries*. London.

Office of Technology Assessment. 1998. *Enhancing agriculture in Africa: a role for US development assistance.* Washington, D.C., OTA-F-356, US Government Printing Office.

Olsson P and Folke P. 2001. Local ecological knowledge and institutional dynamics for ecosystem management: a study of Lake Racken watershed, Sweden. *Ecosystems* 4, 85-104.

Omondi P. 2006. Personal communication.

Orr D. 1992. *Ecological Literacy*. SUNY Press, Albany.

Ostrom E. 1998. Social capital: a fad or fundamental concept? Center for the Study of Institutions, Population and Environmental Change, Indiana University, USA.

Parrott N and van Elzakker B. 2003. Organic and like-minded movements in Africa: development and status. Agro Eco and IFOAM.

Pickett J A. 1999. Pest control that helps control weeds at the same time. BBSRC Business, April.

Pimentel D, Harvey C, Resosudarmo P, Sinclair K, Kunz D, McNair M, Crist S, Shpritz L, Fitton L, Saffouri R and Blair R. 1995. Environmental and economic costs of soil erosion and conservation benefits. *Science* 267, 1117-1123.

Pingali P L and Roger P A. 1995. *Impact of Pesticides on Farmers' Health and the Rice Environment.* Kluwer Academic Press.

Piwoz EG and Preble EA. 2000. *A review of the literature and recommendations for nutritional care and support in Sub Saharan Africa*. SARA/ USAID. Washington DC. At http://pdf.usaid.gov/pdf_docs/PNACK673.pdf.

Popkin B. 1998. The nutrition transition and its health implications in lower-income countries. *Public Health Nutrition* 1(1), 5-21.

Pretty J N. 1995. *Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance.* Earthscan Publications, London; National Academy Press, Washington DC; ActionAid, Bangalore.

Pretty J. 1998. The Living Land: Agriculture, Food and Community Regeneration in Rural Europe. Earthscan Publications Ltd, London, 336pp.

Pretty J N, Brett C, Gee D, Hine R, Mason C F, Morison J I L, Raven H, Rayment M and van der Bijl G. 2000. An assessment of the total external costs of UK agriculture. *Agricultural Systems* 65 (2), 113-136.

Pretty J N, Brett C, Gee D, Hine R, Mason C, Morison J, Rayment M, van der Bijl G and Dobbs T (2001). Policy Challenges and Priorities for Internalising the Externalities of Modern Agriculture. *Journal of Environmental Planning and Management* 44 (2), 263-283.

Pretty J N and Hine R. 2001. *Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence*. Final Report from the SAFE-World Research Project, Feb 2001. Colchester: University of Essex.

Pretty J N and Ward H. 2001. Social capital and the environment. *World Development* 29 (2), 209-227.

Pretty J. 2002a. *Agri-Culture: Reconnecting People, Land and Nature*. Earthscan: London.

Pretty J. 2002b. Lessons from certified and non-certified organic projects in developing countries in Sciallaba N El H and Hattam C. 2002. *Organic Agriculture, Environment and Food Security.* FAO, Rome.

Pretty J, Morison J I L and Hine R E. 2003. Reducing food poverty by increasing agricultural sustainability in developing countries. *Agric. Ecosys. Environ.* 95(1), 217-234.

Pretty J. 2003. Social capital and the collective management of resources *Science*, 302, 1912-1915.

Pretty J (ed). 2005. *The Pesticide Detox*. Earthscan, London, 291pp.

Pretty J, Lang T, Ball A and Morison J. 2005. Farm costs and food miles: an assessment of the full cost of the weekly food basket. *Food Policy* 30(1), 1-20.

Pretty J, Noble A D, Bossio D, Dixon J, Hine R E, Penning de Vries F W T and Morison J I L. 2005. Resource-conserving agriculture increases yields in developing countries. *Environmental Science & Technology* 40(4), 1114-1119.

Putnam R. 1995. Bowling alone: America's declining social capital. *Journal of Democracy* 6(1), 65-78

Putnam R D, with Leonardi R and Nanetti R Y. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press, Princeton New Jersey.

Reganold J P. 2004. Organic agriculture as a form of sustainable agriculture. In *Encyclopedia of Plant and Crop Science*. Marcel Dekker, New York.

Röling N G and Wagemakers M A E. (eds). 1997. *Facilitating Sustainable Agriculture.* Cambridge University Press, Cambridge.

Rosegrant MW, Cline SA, Li W, Sulser TB and Valmonte-Santos V. 2005. Looking Ahead: Long-term Prospects for Africa's Agricultural Development and Food Security. Discussion Paper 41. IFPRI Washington DC.

Rugalema G. 1999. *HIV/AIDS and the commercial agricultural sector of Kenya. Impact, vulnerability, Susceptibility and coping strategies*. UNDP/FAO.

Rundgren G. 2007. Personal communication.

Ruttan V. 1999. The transition to agricultural sustainability. *Proc Natl Acad Sci* 96, 5960-5967.

Sanchez P A and Swaminathan M S. 2005. Hunger in Africa; the link between unhealthy people and unhealthy soils. *The Lancet 365 442-44*.

Sciallaba N El H and Hattam C. 2002. *Organic Agriculture, Environment and Food Security.* FAO, Rome.

Scoones I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis*. IDS Discussion Paper, 72, Univ. of Sussex.

Senzia D A, PELUM, Tanzania. 2005. Personal communication.

Smaling E M A, Nandwa S M and Janssen B H. 1997. Soil fertility in Africa is at stake. In: Buresh R J, Sanchez P A and Calhoun F (eds). *Replenishing Soil fertility in Africa.* Soil Science Society of America Publication No 51. SSSA, Madison, Wisconsin.

Smil, V. 2000. *Feeding the World.* MIT Press: Cambridge MA.

Steiner R, McLaughlin L, Faeth P and Janke R. 1995. Incorporating externality costs in productivity measures: a case study using US agriculture. In Barbett V, Payne R and Steiner R (eds). *Agricultural Sustainability: Environmental and Statistical Considerations.* John Wiley, New York, p 209-230.

Swift M J, Izac A-M N, and van Noordwijk M. 2004. Biodiversity and ecosystem services in agricultural landscapes – are we asking the right questions. *Agric.,Ecosys and Environment* 104, 113-134.

Taylor A et al. 2006. *Overview of the current state of organic agriculture in Kenya, Uganda and the United Republic of Tanzania and the opportunities for regional harmonization*. (UNCTAD/DITC/TED/2005/16). UNCTAD-UNEP Capacity Building Task Force on Trade, Environment and Development. UN, Geneva.

Tegtmeier, E. M.; Duffy, M. D. 2004. External costs of agricultural production in the US. *Int. J. Agric. Sust.*, 2, 1-20.

Tilman, D.; Cassman, K.G.; Matson, P.A.; Naylor, R.; Polasky, S. 2002. Agricultural sustainability and intensive production practices. *Nature*, 418, 671-677.

Tomich T P, Chomitz K, Francisco H, Izac A-M N, Murdiyarso D, Ratner B D, Thomas D E and van Noordwijk M. 2004. Policy analysis and environmental problems at different scales: asking the right questions. *Agric.,Ecossys and Environment* 104, 5-18.

Trewevas, A. Malthus 2002.. Foiled again and again. *Nature*, 418, 668-670.

Tripp R. 2006. The performance of low external input technology in agricultural development. A summary of three case studies. *Int J Agric Sustainability*.

Twarog. 2006. *Organic Agriculture: A Trade and Sustainable Development Opportunity for Developing Countries.* In UNCTAD. 2006. *Trade and Environment Review 2006*. UN, New York and Geneva. At http://www.unctad.org/en/docs/ditcted200512_en.pdf.

UNCTAD. 2006. *Trade and Environment Review 2006*. UN, New York and Geneva. (UNCTAD/DITC/TED/2005/12), available at http://www.unctad.org/en/docs/ditcted200512_en.pdf.

UNCTAD. 2008. *Certified organic export production. Implications for economic welfare and gender equity among smallholder farmers in tropical Africa.* (UNCTAD/DITC/TED/2007/7), available at http://www.unctad.org/trade_env/test1/publications/UNCTAD_DITC_TED_2007_7.pdf,

UNCTAD, UNEP, IFOAM, et al. (2007). Draft Report of the East African Organic Conference, May 2007, available on the UNEP-UNCTAD CBTF website at www.unep-unctad.org/cbtf.

UNCTAD-UNEP 2008. *Best Practices for Organic Policy. What developing country Governments can do to promote the organic agriculture sector.* (UNCTAD/DITC/TED/2007/3), available at http://www.unctad.org/trade_env/test1/publications/UNCTAD_DITC_TED_2007_3.pdf.

UN/SCN (UN System Standing Committee on Nutrition). 2004. *5th Report on the world nutrition situation*. Geneva.

Uphoff N. 1998. Understanding social capital: learning from the analysis and experience of participation. In Dasgupta P. and Serageldin I. (eds). *Social Capital: A Multiperspective Approach*. Washington DC: World Bank.

Uphoff N (ed). 2002. *Agroecological Innovations*. Earthscan, London.

Uphoff N. 2002.. *Agroecological Innovations*. Earthscan: London.

van Elzakker B & Tulip A. 2000. Not aid but trade: Export of organic products from Africa. In T. Alföldi, W. Lockeretz, & U. Niggli, eds. *IFOAM 2000 - The World Grows Organic: Proceedings 13th International IFOAM scientific conference,* pp 567-570. Zürich Vdf Hochschulverlag.

Von Braun J. 2005. *The World Food Situation: An Overview*. IFPRI Washington DC.

Waibel H and Fleischer G. 1998. *Kosten und Nutzen des chemischen Pflanz enschutzes in der Deutsen Landwirtschaft aus Gesamtwirtschaftlicher Sicht*. Vauk-Verlag, Kiel.

Wagah M A. 2005. *Background paper on HIV/AIDS and food nutrition security in Kenya*. RENEWAL/IFPRI. At http://www.ifpri.org/themes/hiv/pdf/AIDSKenya.pdf.

Walaga C. 2000: *Organic Agriculture Trade: State of the Art in Africa. In Quality and Communication for the Organic Market.*. Proceedings of the Sixth IFOAM Trade Conference. IFOAM Tholey-Theley, Germany.

Walaga C. 2002. Organic agriculture in the continents. In: Yussefi, M. and Willer, H. (Eds.). *The World of Organic Agriculture: Statistics and Future Prospects.* IFOAM. Tholey-Theley, Germany.

Walaga C and Kikinda MJ. 2002. Organic Agriculture and Rural Livelihoods in IGANGA District Uganda in Sciallaba N El H and Hattam C. 2002. *Organic Agriculture, Environment and Food Security.* FAO, Rome.

Walaga C. 2005. *Organic Agriculture in Kenya and Uganda. Study Visit Report.* CTA,ORREDE and SACDEP Kenya.The Netherlands. At: http://www.anancy.net/uploads/file-en/study%visit_Organic%farming%20New.pdf.

Wasonga C. 2005. personal communication.

Willer, H and Yussefi M (eds.) 2007. *The world of organic agriculture: Statistics and emerging trends 2007.* IFOAM (Bonn) and FiBL (Frick).

Willer, H, Yussefi-Menzler M and Sorensen N (eds.) 2008. *The world of organic agriculture: Statistics and emerging trends 2008.* IFOAM (Bonn) and FiBL (Frick).

Worster D. 1993. *The Wealth of Nature: Environmental History and the Ecological Imagination*. Oxford University Press, New York.

Wynen w and Vanzetti. 2002. Certified Organic Agriculture: Situation and Outlook. In Sciallaba N El H and Hattam C. 2002. *Organic Agriculture, Environment and Food Security.* FAO, Rome.

Yussefi M and Willer H. 2002. *Organic Agriculture Worldwide 2002–Statistics and Future Prospects.* Foundation Ecology and Agriculture (SOL) in collaboration with the International Federation for Organic Agriculture Movements (IFOAM). (available at www.soel.de/inhalte/publikationen/s_74_04.pdf).

ANNEX

Main stakeholders in the organic sector in Kenya, United Republic of Tanzania and Uganda

Kenya	Uganda	Tanzania
• ABLH – Association for Better Land Husbandry	• Bufumbo Organic Agriculture Producers Association	• COOPIBO–Tanzania
• Baraka Agricultural College	• CIOF – Ceres Institute of Organic Farming	• EPOPA TZ – Export Promotion of Organic Products from Africa
• Bungoma Family Development Programme	• COOPIBO–Uganda	• INADES – Formation
• ICIPE – International Centre of Insect Physiology and Ecology	• Environmental Alert	• KCU – Kagera Cooperative Union
• ICRAF – International Centre for Research in Agroforestry	• EPOPA – Export Promotion of Organic Products from Africa	• KIHATA – Chama Cha Kilimo Hai Tanzania
• ITDG Kenya – Intermediate Technology Development Group	• International Centre for Tropical Agriculture,	• KNCU – Kilimanjaro Native Cooperative Union
• KARI – Kenya Agricultural Research Institute	• Kayunga organic Agriculture producers Association	• Laela Agricultural Centre
• KARI – Kenya Agricultural Research Institute	• KOFT – Organic Farm and Training Centre	• PELUM Tanzania
• KIOF – Kenya Institute of Organic Farming	• LOFP – Lango Organic Farming Production	• TOAM – Tanzania Organic Agriculture Movement
• KOAN – Kenyan Organic Agriculture Network	• Masaka Organic Producers	• TOFO – Tanzania Organic Foundation
• Manor House Agriculture Centre	• NOGAMO – National Organic Movement of Uganda	• TOPP – Tanzania Organization of Permaculture Promoters
• OFOP – Organic Farming Outreach Programme	• Nombe Organic producers Association	
• PELUM Kenya	• PELUM Uganda	
• SACDEP – Sustainable Agriculture Community Development Programme	• RUCID – Rural Community in Development	
• SACRED–Africa – Sustainable Agriculture Centre for Research and Development in Africa	• SANU – Sustainable Agriculture Net of Uganda	
	• Uganda Centre for Sustainable Agriculture	