

Promoting Production and Trading Opportunities for Organic Agricultural Products in East Africa

Capacity Building Study 3: Organic Agriculture and Food Security in East Africa

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Executive Summary

Food security and agricultural production

Modern agricultural methods have brought 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 and are often poor and marginalized from input and 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% since 1990. In the period 2000-2002, the proportion of undernourished people in the total population of Kenya was 33%, in Uganda 19% and 44% in United Republic of Tanzania. The number of underweight children has also increased in Central, Western and Eastern Africa compared to an overall decrease in other developing regions such as Asia, South America and North Africa¹.

The world therefore still faces a fundamental food security challenge, despite steadily falling fertility rates and family sizes, 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; iii) growing urbanisation encourages people to adopt new diets; and iv) 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 modernise agriculture - as this 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 been reflected in major reductions in hunger and poverty in developing countries²

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

- i) the extent to which farmers can improve food production and raise income with *low-cost, locally-available* technologies and inputs,
- ii) whether they can do this without causing further environmental damage
- iii) and the extent to which farmers have the ability to trade

The food security of any region is not simply a question of producing enough food to meet demand but it is influenced by a multitude of factors both natural and man-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, 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 its five capital

¹ FAO 2005, von Braun 2005, UN/SCN 2004

² Trewayas 2002, Smil 2000, Tilman *et al.* 2002, McNeely and Scherr 2003

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 time³, 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 yields from organic systems tend to be stable when converting from low-input systems (those that may have been by-passed by the “green revolution”) such as those frequently found in East Africa; they can outperform traditional systems and can match and often increase those yields of more conventional input intensive systems over time. Gibbon and Borlag (2007) also found that organic conversion in tropical Africa was associated with yield increases rather than with yield reductions

Organic farming increases access to food on three levels, firstly increased quantity of food produced per farm leads to household food security and all members of the household having access to enough food. Secondly, the production and selling of food surpluses at local markets means that farmers benefit from extra incomes increasing their purchasing power, thirdly fresh organic produce is 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% outlining benefits to soil fertility, water supply and 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, more able to sustain plant growth, higher in nutrient content, better able to hold water and more stable which enables farmers to grow crops for longer, with higher yields and when conditions are marginal. This of course can make a major impact on reducing food insecurity of a region.

- **Benefits to community, co-operation and partnerships**

Organic agriculture leads to improvements to social capital, including more and stronger social organisations 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 saw 93% citing improvements to social capital as integral to their success. The formation of farmers’ groups and co-operatives 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 led to increased food security.

Strong networks and links with partners from government, NGOs and organic support organisations such as KOAN, TOAM and NOGAMU help farmers to organise for organic certification, access export and domestic organic markets and gain knowledge of sustainable organic techniques, crops and markets.

³ Ostrom 1990, Pretty 2003

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

Organic farming leads to increasing human capital, all of the case studies detailed in this report have resulted in improvements in this area. All have some element of education, increasing the knowledge of organic farming methods and the skills of farmers. Many cases have shown direct improvements to the health of individuals and communities as a result of increased knowledge, the increase in food yields and improved access to food. The ability of farmers to use their increased understanding of the holistic nature of organic farming in order to adapt and change their farming systems when faced with new challenges has meant that these agricultural systems are 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 ensure access to the premium prices for organic produce. 40% of case studies examined reported improvements to the physical infrastructure and improvements in markets. Access to markets has increased both for farmers who have been able to sell surpluses at domestic markets and for farmers who have been able to sell certified organic produce to international markets.

- **Increase of farmer and household incomes**

Poverty is a major contributing 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 there is no need to purchase synthetic pesticides and fertilisers; ii) extra incomes are gained by selling the surplus produce (resulting from the change to organic); iii) premium prices for certified organic produce can be obtained primarily in East Africa for export but also for domestic markets and iv) farmers can add 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 farmers involved in conventional production (in terms of net farm income earnings).⁵ The majority of case studies in this study were able to include improvements to the financial capital base in their successes. 80% of cases showed increases in farmer and household incomes as a result of becoming organic, going some way to decrease poverty levels and to increase regional food security.

Therefore in addition to the premiums available for organic produce, that access to foreign and domestic markets can bring, the considerable non-monetary benefits (outlined in the sections above) of organic farming should be a major consideration and in fact arguably the *principle* consideration when looking to increase the food security of a region.

Conclusions

- Integrated 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

⁴ Bolwig et al 2007b

⁵ Gibbon and Bolwig 2007

build up natural resources, strengthen communities and improve human capacity thus improving food security by addressing many different causal factors simultaneously.

- All case studies in this research where reliable data has been reported have shown increases in per hectare productivity for food crops, which goes against the popular myth that organic agriculture cannot increase agricultural productivity. Organic production allows access to markets and food for farmers both to obtain premium prices for their produce (export and domestic) but also to use extra incomes to buy extra foodstuffs, education or healthcare. 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 increased incomes from export to buy food and as a result of higher on farm yields thus enabling the wider community to buy organic food at local markets.
- Organic and near organic agriculture methods and technologies are ideally suited for many poor, marginalised smallholder farmers in areas of Kenya, Uganda and Republic of Tanzania as they require minimal or no external inputs, use locally and naturally available materials to produce high quality products and encourage a whole system approach to farming that is more diverse and resistant to stress.
- Certified organic production for the export market, with its premium prices, can undoubtedly lead to a decrease in farmer poverty, 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 for the whole of an integrated agricultural system, as a holistic approach, then “organic” can be synonymous with “sustainable” and increased food security in a region is more likely to occur, at the same time as 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 East Africa and to the improvement of 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 East Africa and 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 scale up, an enabling policy environment is critical.
- Integrated organic agriculture, whether certified or non-certified, is more management and knowledge intensive, and so requires building the learning and cooperative capacity of individuals and groups. This will require investment in social capital development at local level if organic agriculture is to spread.
- We know much more about intensive high-input farming systems than we do about sustainable organic systems so more information on agro-ecological technologies is needed. However this needs an emphasis shift of research and science budgets and the creation better linkages between scientists, agricultural training and extension providers and farmers.
- Partnerships between farmers, farmer groups, NGOs and CSOs, organic movement organisations, 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 from local to national and international levels, as well as to encourage more links between government, NGOs, and the private sector.

- Improving agricultural sustainability through adoption of organic agriculture in East Africa may not bring all the solutions, but promising progress has been made in recent years. Whether organic farming will result in enough food to meet current and future needs after continued population growth and development in African countries, whilst optimistic, can never be totally certain. However, the current situation of widespread food insecurity means that conventional farming systems clearly do not have all the answers either. The results that we have seen for a transition to organic agriculture are highly promising for food security in East Africa. There is also scope for additional confidence, as the evidence indicates that this productivity can grow over time.⁶ With further specific support, these 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.

⁶ Borlaug 1994a, b; Avery 1995

Section 1. Overview

1.1 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% and aggregate world food production growing by 145%. Between the early 1960s and mid-1990s, average cereal yields grew from 1.2 t/ha to 2.52 t/ha in developing countries whilst total cereal production has grown from 420 to 1176 million tonnes per year⁷.

Over the same period, world population has grown from three to six billion, but globally per capita agricultural production has overtaken population growth and for each person today, there is an additional 25% more food compared with 1960. However this is not the case for everyone, it varies regionally and in Africa for example food production per person is 10% 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, 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 marginalized from input and product markets.

The recent advances in aggregate productivity have therefore not brought reductions in the incidence of hunger for all. In the early 21st century, there are still more than 800 million people hungry and lacking adequate access to food. A third are in East and South-East Asia, another third in South Asia, a quarter are in Sub-Saharan Africa, and 5% each in Latin America/Caribbean and in North Africa/Near East.

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”*⁸. 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 deficiency⁹.

Although average per capita food consumption in 2003 was 2780 kcal day⁻¹, consumption in 33 countries is still less than the recommended 2200 kcal day⁻¹. In addition to 852 million people hungry, globally there are 126 billion underweight children and over 2 billion people suffering from some form of micronutrient deficiency. Almost 50% of pregnant women in Sub-Saharan Africa are affected by iron deficiency anaemia¹⁰.

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% since 1990. In the period 2000-2002, the proportion of undernourished people in the total population of Kenya was 33%, in Uganda 19% and 44% in United Republic of Tanzania. The number of underweight children has also increased in Central, Western and Eastern Africa compared to an overall decrease in other developing regions such as Asia, South America and North Africa¹¹.

⁷ FAO 2005, Conway and Pretty 1991, Heffernan 1999, Smil 2000, Pretty and Hine 2001

⁸ Gillespie and Haddad 2001, FAO 1996.

⁹ FAO 1996

¹⁰ FAO 2005, von Braun 2005, FAO 2005, UN/SCN 2004, Micronutrient Initiative and UNICEF 2005, IFPRI 2005

¹¹ FAO 2005, von Braun 2005, UN/SCN 2004

The world therefore still faces a fundamental food security challenge, despite steadily falling fertility rates and family sizes, 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; iii) growing urbanisation encourages people to adopt new diets; and iv) climate change threatens both land and water resources.

World population is widely expected then to reach 9 billion by the next generation and by this time, 84% of people will be in those countries currently making up 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 developing country person will still only consume half of the cereal and a third of the meat compared with a person in an industrialised country, so food insecurity and malnutrition will still persist¹².

1.2 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, and five types of asset, natural, social, human, physical and financial capital, are now recognised as being important¹³. These five types of 'capital' asset are described below:

1. *Natural capital* produces environmental goods and services, and is the source of food (both 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 landscape¹⁴.
2. *Social capital* produces a mutually beneficial collective action, contributing to the cohesiveness of people in their societies. The social 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 mutually-agreed or handed-down. These are connected and structured in networks and groups¹⁵.
3. *Human capital* is the total capability residing in 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 organisational skills are particularly important in making other resources more valuable¹⁶.
4. *Physical capital* is the store of human-made material resources, 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.

¹² von Braun 2005, Uphoff 2002, Pinstrip-Andersen *et al* 1999, Pretty and Hine 2001

¹³ Coleman 1988, 1990, Putnam 1993, 1995, Costanza *et al* 1997, 1999, Carney 1998, Flora 1998, Ostrom 1998, Pretty 1998, Scoones 1998, Uphoff 1998, Pretty and Ward 2001, Pretty and Hine 2001, Pretty 2003.

¹⁴ Costanza *et al* 1999, MA 2005

¹⁵ Flora and Flora 1996, Pretty 2003, Cramb and Culaseno 2003

¹⁶ Orr 1992, Byerlee 1998, Lieblin *et al.* 2004, Leeuwis 2004

5. *Financial capital* is more of an accounting concept, as it serves as a facilitating role rather than as 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 inputs¹⁷. 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, whilst unsustainable systems deplete these assets, leaving less for future generations.

For example, i) an agricultural system that erodes soil whilst producing food results in costs that others must bear¹⁸, ii) another system that sequesters carbon in soils through organic matter accumulation helps to mediate climate change, iii) a diverse agricultural system that enhances on-farm wildlife for pest control contributes to wider stocks of biodiversity, whilst iv) a simplified modernised system that eliminates wildlife does not contribute to biodiversity. 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 patterns¹⁹. Agriculture is, therefore, fundamentally multifunctional as it produces many unique food and non-food functions that cannot be produced by other economic sectors so efficiently.

Increased food supply is a necessary though not sufficient condition for eliminating hunger and poverty. What is important is who produces the food, has access to the technology and knowledge to produce it, and who has the purchasing power to acquire it.

1.3 Causes of food insecurity

The food security of any region is not simply a question of producing enough food to meet demand but it is influenced by a multitude of factors both natural and man-made (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. Furthermore, many of the causes of food insecurity are also symptoms, creating a cyclical effect that can result in further food insecurity.

Agriculture, by its inherent multifunctionality, has the potential to both influence and address the factors that contribute to food insecurity. As discussed earlier in this report, organic agriculture relies on its five capital assets for success and so contributes to and builds up stocks of these natural, social and economic resources over time²⁰, thus often reducing many of the factors that lead to food insecurity.

Some examples of the positive side effects of organic agricultural systems that have helped to address the food security issues (outlined in Box 1.) and that can build natural capital, strengthen communities (social capital) and develop human capacities include improvements to:

¹⁷ Worster 1993, Pretty and Hine 2001

¹⁸ Often referred to as Externalities

¹⁹ Carney 1998, Dasgupta 1998, Ellis 2000, Pretty *et al.* 2005

²⁰ Ostrom 1990, Pretty 2003

- availability of food
- natural capital
- social capital
- human capital
- physical capital
- financial capital
- external factors

Each of these issues is examined in more detail within Box 5. in section 2. Section 2. of this study also contains more examples of such improvements within the narratives of case studies from East Africa.

Box 1. Factors contributing to food insecurity in East Africa

1. Availability of Food	
Food production	<ul style="list-style-type: none"> • 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
Consistent access to food	<ul style="list-style-type: none"> • 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 year²¹
2. Natural Capital	
Natural resources	<ul style="list-style-type: none"> • A degraded natural environment will compromise food production in an area, for example poor soil quality, eroded landscapes or inadequate water resources
Diversity of agriculture	<ul style="list-style-type: none"> • Diverse agricultural systems are more resilient to stresses than mono-cropped systems so are more likely to promote food security
3. Social Capital	
Community and group issues	<ul style="list-style-type: none"> • 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 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	
Education	<ul style="list-style-type: none"> • Lack of education and agricultural/ nutritional knowledge can affect farmer capacity to adapt to change or to cope with food production stresses
Ill-health and diseases	<ul style="list-style-type: none"> • Malnourished people are not able to produce food as effectively as those who are well-fed • The prevalence of diseases such as HIV/AIDS have 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 food²². In sub-Saharan Africa 11 million children are orphaned by HIV/AIDS²³. Mortality and

²¹ Benson 2004

²² Rosegrant *et al.* 2005

²³ FAO 2002

²⁴ Rugalema 1999, Sanchez and Swaminathan 2005 and Wagah 2005

Gender issues	<p>morbidity in HIV/AIDS affected households has lead to decreased farm sizes, loss of income at household level, increased dependency ration and a general increase in food insecurity²⁴</p> <ul style="list-style-type: none"> In many regions women are the major agricultural labour force but are not always recognised for this so may not control household budgets, often have poor education
5. Physical Capital	
Poor infrastructure	<ul style="list-style-type: none"> Poor infrastructure (roads, communications markets for example) affects food security
Lack of markets	<ul style="list-style-type: none"> a lack of or limited markets (both domestic and international) affects food security
Access to appropriate technologies	<ul style="list-style-type: none"> Lack of appropriate agricultural knowledge, technologies, methods or inputs can affect food security
6. Financial capital	
Poverty	<ul style="list-style-type: none"> Poverty remains the root cause of hunger and malnutrition in the world²⁵
Access to markets	<ul style="list-style-type: none"> Lack of access to markets means that farmers and communities cannot purchase food in times of shortage, leading to inconsistent food availability thus contributing to food insecurity
7. Other External Factors	
Land tenure issues	<ul style="list-style-type: none"> Land tenure issues can contribute to food insecurity in a number of ways which vary depending on 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 and so as a result farm plots get continually smaller, making it hard to sustain enough food for household.
Political issues	<ul style="list-style-type: none"> Political problems including corruption, collusion and nepotism can significantly inhibit attempts to tackle food insecurity²⁶
Climate and natural disasters	<ul style="list-style-type: none"> In areas which are prone to drought or suffer from 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 number of deaths from natural disasters has been more than the average for the decade before²⁷
Armed conflicts and wars	<ul style="list-style-type: none"> Political unrest, armed conflicts and wars contribute to food insecurity and prevent food from being produced or accessed Political conflicts are often associated to food insecurity as both a cause and an effect²⁸

²⁵ IFPRI 2005

²⁶ Rosegrant *et al.* 2005

²⁷ EM-DAT 2005

²⁸ Messer and Cohen 2004

1.4 Food security challenges for agriculture in East Africa

Clearly then there are 2 emergent food poverty and food security challenges:

1. How to find ways to maintain and enhance food production whilst 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.

2. What is the best way to increase agricultural productivity in East Africa and other developing countries that still, have millions of people 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 agriculture²⁹; ii) increasing per hectare production in agricultural exporting countries³⁰ or iii) increasing total farm productivity in developing countries which are most going to need the food.

The conventional wisdom is that, in order to double food supply, efforts need to be redoubled to modernise agriculture - as this 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 been reflected in major reductions in hunger and poverty in developing countries³¹

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

- iv) the extent to which farmers can improve food production and raise income with *low-cost, locally-available* technologies and inputs,
- v) whether they can do this without causing further environmental damage
- vi) and the extent to which farmers have the ability to trade

1.5 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 industrialised). These include biodynamic, community-based, ecoagriculture, 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 terms can qualify as sustainable³².

However agricultural systems high in sustainability can be taken as those that aim to make the best use of environmental goods and services whilst not damaging the five assets – particularly natural, social and human capitals³³. The key principles for sustainability are to:

²⁹ by converting new lands to agriculture, but with the result that services from forests, grasslands and other areas of important biodiversity are lost

³⁰ mostly in industrialised countries, so that food can be transferred or sold to those who need it

³¹ Trewayas 2002, Smil 2000, Tilman *et al.* 2002, McNeely and Scherr 2003

³² 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, Trewavas 2001

³³ Altieri 1995, Pretty 1995, 1998, 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

- i. integrate biological and ecological processes such as nutrient cycling, nitrogen fixation, soil regeneration, allelopathy, competition, predation and parasitism into food production processes;
- ii. minimise 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 for pest, 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 likely to be many pathways towards agricultural sustainability, and so 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 systems³⁴.

1.6 Organic Agriculture

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

In contrast to 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 agriculture systems in which maximum reliance is put on i) local or on-farm renewable resources, and ii) the management of ecological and biological processes. The use of external inputs, whether inorganic or organic, is reduced as far as possible.

“Certified organic agriculture” is a defined and certified system of agricultural production that seeks to promote and enhance ecosystem health whilst minimising adverse effects on natural resources. It is seen not just as a modification of existing conventional practices, but as a restructuring of whole farm systems. The FAO/WHO Codex Alimentarius guidelines define organic agriculture as “*a holistic production management [whose] primary goal is to optimise the health and productivity of interdependent communities of soil, life, plants animals and people*”. Similarly, the International Federation of Organic Agricultural Movements, with over 750 member organisations 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*”³⁵. Principles of organic agriculture according to IFOAM are shown in Box 2.

However, "organic agriculture" is not limited to certified organic farms and products but can include all productive agricultural systems that use sustainable, natural processes, rather

³⁴ Chambers *et al.* 1989; Uphoff 1998; Bunch and Lopez 1999; Olsson and Folke 2001; Pretty and Ward 2001

³⁵ Lampkin and Padel 1994, FiBL 2000, Scialabba and Hattam 2002, Caporali *et al.* 2003, Reganold 2004, FAO/WHO 2001, IFOAM 2006a, IFOAM 2002

than external inputs, to enhance agricultural productivity³⁶. Organic farmers adopt practices to conserve resources, enhance biodiversity, and maintain the ecosystem for sustainable production.

Box 2. IFOAM's Principles of Organic Agriculture

IFOAM 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.

There has been a huge growth in both the international and domestic market for organic produce worldwide and there are profitable returns for certified organic products. In East African countries where an established and widespread domestic market for organic produce is not present, then the majority of certified organic production is for export. Whereas certification is essential for export of organic produce to Europe and the U.S., for domestic consumption and local markets in East Africa it is not. Organic certification for domestic markets certainly gives the consumer the security in knowing that food has been produced according to strict organic production standards offering a "quality assurance". In East Africa, along with other developing countries, the lack of certification and quality control for domestic markets has been partially addressed by the development of participatory guarantee systems which guarantee the integrity of organic produce for local domestic markets³⁷.

However, the costs of becoming a certified organic producer are often prohibitive for small-scale farmers in both 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 stresses) of certification to 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 co-operatives 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

³⁶ Scialabba and Hattam 2002

³⁷ Twarog 2007

inspection, certification and labelling. “Near organic” agriculture refers to *sustainable* traditional farming systems.

1.7 The Extent of Organic Agriculture in East Africa

The lack of a recognized system of organic agriculture data collection globally has meant that it is difficult to obtain reliable information on the extent of organic farming. However, organic agriculture continues to grow worldwide. According to a study by the International Federation of Organic Agricultural Movements (IFOAM) and the Foundation for Ecology and Agriculture (SOL) in Germany, the global area of land under certified organic agriculture in 2002 was 17.8 million hectares and is now estimated at 25 million hectares. Globally, this relates to certified organic agriculture occupying about 1% of agricultural land and 1-2% of agricultural sales by value³⁸.

In recent years there has been a dramatic increase in the adoption of organic farming in industrialised countries. In Europe, there were just over 120,000 ha under organic farming in 1985 and by 2000 this had risen to more than 3 million hectares managed by 120,000 farmers. In the late 1990s, 550,000 ha of land were certified under organic production in the USA, managed by 5000 growers³⁹.

Organic farming is significantly more developed in South and Eastern Africa than other regions of Africa and accounts for over three quarters of the certified organic land of the continent. In some countries the certified organic sector is a result of a few large export oriented farms converting to organic production (e.g. South Africa, Zambia and Malawi) and in other countries the sector is a consequence of significant attempts to engage smallholders in export commodity production (e.g. Uganda and Tanzania⁴⁰). In recent years, East Africa has also started to see vibrant growth in the domestic markets for organic products.⁴¹

The story in East Africa is that Uganda had 122,000 ha under certified organic production in 2004⁴² and in Kenya, 180,000 ha is under organic production in 2005⁴³. In the Republic of Tanzania in 1998 there were only 4000 ha under organic production but there has been significant progress and in 2005 it was estimated at 45,500 ha⁴⁴. Key information about organic agriculture in Kenya, Uganda and Republic of Tanzania can be found in Box 3.

However, in some developing countries there are 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 agriculture⁴⁵. In Africa, at least 730 000 households covering 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 hectares⁴⁶.

A large proportion of the labour force is employed in agriculture in Africa (60-80%) and the majority of these farmers (many of whom are women) are smallholders with farms of less

³⁸ Yussefi and Willer 2002, Grolink 2006, Morison *et al.* 2005

³⁹ Lampkin and Midmore 2000, Pretty 2002b

⁴⁰ Parrott and van Elzakker 2003

⁴¹ Twarog 2007

⁴² Grolink 2005

⁴³ Walaga, 2003 and Taylor 2005

⁴⁴ Walaga 2000, 2002, 2005, Envirocare 2005

⁴⁵ Wynen and Vincetti 2002, Grolink 2006

⁴⁶ Pretty and Hine 2001, Pretty *et al.* 2005

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% 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 fertilisers is less than 1 kg per hectare per year, which implies that most land is never fertilised with synthetic fertilisers⁴⁷.

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

Kenya	Uganda	Republic of Tanzania
<ul style="list-style-type: none"> • Organic agriculture from 1980s • Large private companies and CSOs have led the way with certified organics for export • Also smallholder farmers organised into groups – some are registered organic • National representative organisation 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 domestic market but on the increase • Estimates of 182,586 ha certified organic with 15,815 farmers. • Much agricultural production is organic but not certified • Government has not recognised role of organic agriculture and no specific policy promoting organic agriculture 	<ul style="list-style-type: none"> • Certified organic farming mainly smallholder farmers organised 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. • More than 40,000 certified organic households • Estimates of 182,000 ha certified organic • National representative organisation 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 reported to be interested in organic agriculture. 	<ul style="list-style-type: none"> • Certified organic farming for export mainly by smallholders organised 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 already but not certified • Estimates of 38,875 ha certified organic with 34,791 farmers • Recently formed national representative organisation of stakeholders in organic agriculture - Tanzania Organic Agriculture Movement (TOAM) • No specific policy promoting organic agriculture although existing National Agricultural Policy has clauses on organic agriculture

Source: Walaga 2000, 2002, Taylor 2005, Grolink 2005, Envirocare 200, Rundgren 2007, Bolwig et al 2007a, Willer and Yussefi 2007.

⁴⁷ Altieri 2002, OTA 1998, Wynen and Vincetti 2002

Section 2. Evidence from East 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 but it is influenced by a multitude of factors both natural and man-made (see Box 3). 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, creating a cyclical effect that can result in further food insecurity.

2.1.1 Improvements in availability of food

In industrialised more intensive agricultural systems the productivity of organic agriculture tends to vary through the different stages transition (i) in-transition from conventional/traditional to organic management; (ii) in-conversion from traditional to organic management; (iii) organic management based on input substitution, and (iv) complete shift to a systems approach⁴⁸.

Particularly in these more industrialised 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 industrialised agricultural systems⁴⁹.

In developing countries by comparison, evidence from research and from this study shows that yields from organic systems tend to be stable when converting from low-input systems (those that may have been by-passed by the “green revolution”) such as those frequently found in East Africa; they can outperform traditional systems and can match and often increase those yields of more conventional input intensive systems over time. Gibbon and Borlag (2007) also found that organic conversion in tropical Africa was associated with yield increases rather than with yield reductions.

Organic farming can lead to increased food production, in many cases we have seen a doubling of yields, which makes an important contribution to increasing the food security of 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 marginalised areas or where traditional farming methods are used.

Increased household food security is frequently reported after a switch to organic production, as the majority of smallholder farmers in East Africa grow the bulk of their crops for domestic consumption with only a small proportion for sale. Organic farming techniques are therefore widely recognised as increasing food security in this context, particularly in rain fed agricultural systems⁵⁰

⁴⁸ Altieri 2002

⁴⁹ Altieri 2002 and Pretty 2002

⁵⁰ Walaga 2005

Organic farming also increases access to food on three levels, firstly increased quantity of food produced per farm leads to household food security and all members of the household having access to enough food. Secondly, the production and selling of food surpluses at local markets or by barter schemes means that farmers benefit from extra incomes increasing their purchasing power and fresh organic produce is available to more people in the wider community. Thirdly 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 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 and produce can be sold to create additional income for families. Maintaining a wide variety of crops 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.

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 topsoil of the land, which is widely recognised 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, adding compost, animal dung or green manures. The addition of elements of agroforestry, check dams and terracing (amongst other methods) also stabilises the soil and thus reduces soil erosion. As a result soils are healthier, more able to sustain plant growth, higher in nutrient content, better able to hold water and more stable which enables farmers to grow crops for longer, with higher yields and when conditions are marginal. This of course can make a major impact on reducing food insecurity of a region.

2.1.3 Improvements to social capital

Organic agriculture leads to improvements to social capital, including more and stronger social organisations 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 these social capital increases, so improving people's capacity to work together on common resource management problems, forming groups for pest, irrigation, watershed, joint forest or credit management for example. Formation of working groups benefits farming households where labour shortages occur, for example when people are ill, suffering from HIV/AIDS and in times of hardship. The creation of co-operatives and

marketing groups also helps farmers i) share knowledge and good practice, ii) share the costs of organic certification and iii) meet the demands for large quantities of organic produce required at one time for some export companies.

Strong networks and links with partners from government, NGOs and organic support organisations such as KOAN, TOAM and NOGAMU help farmers to organise for organic certification, access export and domestic organic markets and gain knowledge of sustainable organic techniques, crops and markets.

2.1.4 Improvements to human capital

Organic farming leads to improvements to human capital – knowledge and skills, including more local capacity for farmers to experiment and solve their own problems; improvements to health such as reduced incidence of malaria in rice-fish zones, increased self-esteem in formerly marginalised 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. By using organic techniques and principles, the knowledge and skills of farmers is built up so that they improve 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 both sell surpluses when they are food secure and also gain premium prices for certified organic produce both for export and domestic markets. This means that additional income generated is available for paying school fees so increasing the education of the wider community.

A transition to organic farming can greatly benefit the health of both farmer households and the wider community alike. An integrated organic farming system leads to increases in production and the variety of crops grown or animals kept which positively increases 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 incomes are also available for medical expenses, leading to better health, particularly for children.

Farmer health is also improved with organic farming through the cessation of spraying with synthetic pesticides. Risks of illness and death associated with 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 fed⁵¹. 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

⁵¹ Sanchez and Swaminathan 2005, Fawzi et al 2004 and Piwoz and Preble 2000.

behind⁵².

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 ensure access to the premium prices for organic produce.

Government policy such as the PMA in Uganda has recognised that profitable market engagement is likely to lead to increased food security⁵³. New partnerships have formed which in turn may lead to increased communication networks and potentially to increased transport links. Organic farming in East Africa has undoubtedly increased the access to organic markets both in terms of numbers of farmer and types of farmer (small-scale producers organised in groups).

There are often increased employment opportunities with organic production both from selling surpluses, accessing the export organic market and form the opportunity to add value to the organic produce by processing and marketing activities.

2.1.6 Improvements to Financial Capital

Poverty is a major contributing 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 there is no need to purchase synthetic pesticides and fertilisers; ii) extra incomes are gained by selling the surplus produce (resulting from the change to organic); iii) premium prices for certified organic produce can be obtained primarily in East Africa for export but also for domestic markets and iv) farmers can add 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.⁵⁴

A recent study concluded that certified organic farms involved in production for export were significantly more profitable than those farmers involved in conventional production (in terms of net farm income earnings).⁵⁵ However it is worth noting that there has been found to be substantial differences in profitability between different cash crops for organic production. Borlag et al (2007b) states that *“the average income of organic pineapple growers was three times higher than for cocoa-vanilla farmers and more than five times higher than for 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 fertilisers 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 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

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.

⁵² FAO 2002

⁵³ Bolwig et al 2007b

⁵⁴ Bolwig et al 2007b

⁵⁵ Gibbon and Bolwig 2007

This improved purchasing power brings many associated benefits to the farmers, farmer families and local communities alike. Improvements in the availability of food from organic farming systems either as increased yields or as food to buy, increases the food security, health and nutritional status of a region.

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

Therefore in addition to the premiums available for organic produce, that access to foreign and domestic markets can bring, the considerable non-monetary benefits (outlined in the sections above) of organic farming should be a major consideration and in fact arguably the *principle* consideration when looking to increase the food security of a region.

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, 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. How the land recovers from stresses such as flooding and erosion, can also be positively affected by organic practices.

This increased knowledge of natural pest and predator relationships increases farmers' resilience and capacity to implement changes in their farms during times of pest infestation. 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

Undoubtedly premium prices can be obtained for certified organic produce for export which can directly impact on farmer incomes addressing poverty and so impact on food security issues. There is much evidence (see later in this section) that both organic food and beverage production for the export market and selling of surplus food to the domestic organic market can result in increased farmer incomes, making the difference to farming households for food security and access to education and healthcare.

Where convention productions systems have encouraged monocropping (for cashews in Tanzania or tea in Kenya for example) then the organic systems have also often resembled monocrops. Simply substituting the synthetic pesticides and fertilisers for purchased bio-pesticides and organic fertilisers, 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 and cannot essentially be considered "sustainable". However, across the majority of the export market for organic produce in East Africa there is, in reality, very little

monocropping⁵⁶. Where organic farming principles are adopted for the whole of an integrated agricultural system, as a holistic approach, then “organic” can be synonymous with “sustainable” and increased food security in a region is more likely to occur, at the same time as building up natural, human and social resources.

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) and to 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 shortages⁵⁷.

2.2 Evidence from organic agriculture 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 countries⁵⁸. The largest study examining sustainable agriculture initiatives in developing countries comprised the analysis of 286 projects in 57 countries⁵⁹. This study found on 37 million hectares, average yields increased by 79% over a variety of sustainable agricultural systems and crop types.

We have reanalysed our database on agricultural sustainability to produce a summary of the extent and impacts of organic and near organic projects in Africa (Box 4).

Box 4. Extent 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
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 within remit of this study	3 (Uganda Tanzania and Kenya)	44	1,300,000	1.2	+120%
Kenya	1	18	1,000,000	0.5	+179%
Tanzania	1	9	27,000	0.06	+67%

⁵⁶ Rundgren 2007

⁵⁷ Hine and Pretty 2001, Altieri 2002, Pretty *et al.* 2005, IFOAM 2006c

⁵⁸ Uphoff 2002; McNeely and Scherr 2003; Pretty *et al.* 2003

⁵⁹ Pretty *et al.* 2005

Uganda	1	17	241,000	0.68	+54%
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Note: variations in the increases in yields do not necessarily mean that organic agriculture is more or less inherently successful by country, rather it varies depending on the type of project and the crops/livestock produced.

2.3 Narrative Case Studies from East Africa

As has been demonstrated in section 2.1, organic agriculture has clearly produced increases in food production. However in addition to this, a change to organic farming has led to improvements in other contexts including environmental improvements, a strengthening of communities, improvements in the education and health of individuals and a reduction in poverty.

Drawing on such empirical evidence, a typology of improvements has been developed to demonstrate where alterations in the farming system and a change to organic farming methods can positively affect resources of the 5 capitals⁶⁰. The first 4 improvements involve those that positively affect the environment (natural capital) in different ways; the next 2 improve social and human capital (Mechanisms 5-6), the next 1 refers to physical infrastructure and access to markets (mechanism 7) and the third 2 involve improving financial returns to farmers and/or their access to finance and credit (Mechanisms 8-10) see Box 5.

Box 5. Improvement typology for Organic Agriculture

Improvement	Mechanism	Details
Natural capital – the environment	<i>1. Better use of locally-available natural resources</i>	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 –. The 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.
	<i>2. Intensify microenvironments in farm system (gardens, orchards, ponds)</i>	A further improvement to farm systems involves the intensification of a single sub-component of their farm, while leaving the rest alone, such as through double-dug beds, adding vegetables to rice bunds, kitchen gardens, silt traps, gully cropping or digging a fish pond. These technologies can significantly increase total food production for rural livelihoods, particularly of protein and vegetables. The beneficiaries are often children during 'hungry' seasons.
	<i>3. Diversify by adding new regenerative components</i>	The third type of improvement to natural capital involves the diversification of the whole agroecosystem 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; agroforestry and integrated livestock. These technologies can result in synergistic interactions - where one component of the system positively contributes to the success of other components.
	<i>4. Removal or better use of non-renewable inputs and</i>	Where external and non-renewable inputs are being used, then the system can be made more sustainable by

⁶⁰ Pretty and Hine 2001

	<i>external technologies</i>	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. The 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).
Social capital –people and groups	<i>5. Social and participatory processes leading to group action</i>	These improvements focus on social and participatory processes that lead to social capital increases, so improving people's capacity to work together on common resource management problems, forming groups for pest, irrigation, watershed, joint forest or credit management. Also includes horizontal partnerships between external agencies (e.g. government and NGOs; private and public).
Human capital - individuals	<i>6. Human capital building through continuous learning programmes</i>	These improvements focus on building the knowledge and skills of farmers to improve analytical skills and capacities to innovate and control their farm systems. A major constraint in the transitions towards more sustainable systems has been the 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. Includes 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	<i>7. Access to markets and infrastructure</i>	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	<i>8. Access to affordable finance (credit, grants, subsidies)</i>	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 organisation, particularly of women), or through families accessing new sources of external finance (grants and subsidies, or from tourists and visitors).
	<i>9. Added value through processing to reduce losses and increase returns</i>	A variety of options are available to increase the returns to families from their production, either by reducing losses to pests (better storage and treatment) and inefficient processes (e.g. fuel-saving stoves); or by adding value before sale or use (conversion of primary products through processing).
	<i>10. Adding value through direct or organised marketing to consumers</i>	Farm families can also add value to their production through better marketing. This may involve improvements to physical infrastructure (e.g. roads, transport); or through direct marketing and sales to consumers (thus cutting out wholesalers and 'middlemen'). Include rural roads and infrastructure; 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 Sciallab 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, when a combination of different improvement types are used the dividend of synergistic effects are seen (where the whole is greater than the sum of the parts). For example, soil and water conservation that emphasises terracing and other physical measures to prevent soil loss is much more effective than when combined with biological methods that seek to increase the productivity of the system, such as with green manures and cover crops, or with finance for credit groups that reduces indebtedness of households.

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

2.2.1. The Manor House Agricultural Centre, Kitale, Kenya⁶¹

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, as well as conduct adaptive research. In 1999 the Centre had trained some 6000 farmers in 185 community groups, of whom 3000 are known to have adopted grow bio-intensive agriculture (BIA). In 2005 Emaunel Omondi reports that over 70,000 Kenyans have been taught bio-intensive agriculture 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, 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 have found phosphorus to be limiting over periods of 6 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 has impacted on 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 (U.S. \$268) from sales of Sukuma Wiki (similar to tree collards). My 0.3 acres of land is producing plenty and 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

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

⁶¹ Source: University of Essex SAFE Research Database 2001, Ecology Action 2000, 2005
<http://www.growbiointensive.org/biointensive/Kenya.html> and
<http://www.growbiointensive.org/newsletter/may2000/biointensive-applic-3.html>

2.2.2. Organic Cotton, GTZ, Tanzania⁶²

Cotton is the second most important export for Tanzania and is generally produced by smallholders 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 liberalised 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 GTZ-Protrade program in order to run 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, because cotton is produced here at low-yield level so risks of yields falling during conversion are less and so farmers were therefore 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 so can provide animal manure fertilisers for their cotton crop. The GTZ-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.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

2.2.3. SACDEP, Thika, Kenya⁶³

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, savings and credit schemes and 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 organised community groups of about 30 families. SACDEP operates under the 4 principles of sustainable agriculture i) Ecological feasibility, ii) Environmentally friendly, iii) Social justness and iv) Culturally acceptability. Topics covered in the SACDEP training programme include natural soil fertility management;

⁶² Source: G Ratter in “Organic Cotton” by D Myers and S Stolton (1999, IT Publications). University of Essex SAFE Research Database 2001

⁶³ Source SACDEP 2006 personal communication

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 3-4 years in which time productivity has been reported to increase by 50% giving the farmers food security and surplus produce to sell. SACDEP also facilitates the development of Smallholder Farmers Organisation (SFOs), that together address common issues such as value adding for produce, marketing, savings and credit. SFOs in this development stage also agree on sustainable and organic norms for all the producers in the group to use. Incomes have increased as a result, up 40%, enabling farmers to meet basic needs such as paying school fees and medical expenses.

Key benefits of case study

Improvement to:	Mechanism:	Seen in this case study?
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.4. Certified organic cotton in Uganda⁶⁴

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 made 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.

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 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% organic premium on export, which relates to a 15-20% premium over 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 therefore well structured and received extensive support from

⁶⁴ Source: Walaga, 1997; van Elzakker and Tulip, 2000, Rundgren 2007

Export Promotion of Organic Products from Africa (EPOPA) under the Swedish International Development Co-operation 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.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

2.2.5. Community mobilisation against desertification (C-MAD) programme, Kenya⁶⁵

The 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 in some 1000 hectares, who have seen maize yields improve from about 2 to 4 t/ha. Income has also increased for many farmers following the cultivation of fruit (citrus, orange, mango, 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

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	

⁶⁵ Source: Peter Omondi, C-MAD and Questionnaire for University of Essex SAFE Research Database

	<ul style="list-style-type: none"> • 	
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.6. Small-Scale Aquaculture in Malawi⁶⁶

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 jointly to map resource flows on farms, and then identify the potential for adjustments that would bring synergistic effects. It has worked with some 2000 individual farmers on both vegetable improvements in home gardens and fish-pond aquaculture. This integrated agriculture-aquaculture component of farmers often comprises only 500 m² 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 2700 to 4000 kg/ha, and fish ponds produce the equivalent of 1500 kg/ha of fish – a new source of food for households. These integrated farms also produce six times more cash than conventional farms - with the vegetable-fish element contributing up to 70% 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 1500 kg/ha. Amongst those farmers trained only through the conventional Training and Visit system in southern Malawi, yields by contrast fall 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

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets • 	
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.7. ICIPE *Vutu-sukumu* (Push-pull) pest management in smallholder systems, Kenya⁶⁷

The work of ICIPE is explicitly focused on designing low-cost integrated pest management technology. It works closely with farmers to test and adapt technologies. It is also 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

⁶⁶ Source: Randall Brummet, Daniel Jama; Brummet 2000 and Questionnaire for University of Essex SAFE Research Database

⁶⁷ Sources: Hans Herren, John Pickett, ICIPE annual reports; Pickett, 1999; Khan et al, 2000, ICIPE 2005

crop and attract them to intercrop or barrier forage grasses. It has found extra-ordinary 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)⁶⁸.

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 3000 farmers have adopted these push-pull technologies.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	

2.2.8. Ethiopia: Cheha Integrated Rural Development Project⁶⁹

This is an example of an integrated and relatively small-scale project making a substantial impact on regional food security. It has been working in south-west Ethiopia since the drought of 1984, and has introduced of 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

⁶⁸ 1. The forage grasses, *Pennisetum purpureum* (Napier grass) and *Sorghum vulgare sudanense* (Sudan grass), attract greater oviposition by stem borers than cultivated maize.

2. Non-host forage plants, *Melinis minutiflora* (molasses grass) and *Desmodium uncinatum* (silver leaf) repel female stalk borers (*Chilo spp*).

3. 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.

4. Molasses grass also emits a chemical, (E)-4,8-dimethyl-1,3,7-nonatriene, which summons the borers' natural enemies.

5. 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.

6. Sudan grass also increases the efficiency of the natural enemies (the parasitism rate on larvae of the spotted stemborer, *Chilo partellus* more than tripled, from 4.8% to 18.9% when the grass was planted around maize in a field and from 0.5% to 6.2% on *Busseola fusca*, another important pest).

7. 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.

⁶⁹ Source: Food for the Hungry International and Questionnaire for University of Essex SAFE Research Database 2001

agriculture on about 5000 ha, resulting in a 70% improvement of overall nutrition levels within the project area, along with a 60% 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 reliant entirely on emergency food aid has now become able to feed itself and have enough left over to contribute to surplus. The real promise of the programme, however, lies in the fact that farmers are replicating activities on their own initiative (including those outside the project area), where once they had to be encouraged to participate through food for work payments.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets • 	
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.9. Mumias Education for Empowerment Project, Kakamega, Kenya⁷⁰

The MEFE project works with some 2070 households in Kakamega, and area of western Kenya characterised by high rates of rural malnutrition, infant mortality and non-literacy. Severe food insecurity affected 1 in 4 people before the project, with many households only food secure for 1-3 months per year. The project uses a structured learning process (REFLECT) to encourage all groups to analyse critically 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 3-6 months for a typical household. The increased consumption of protein particularly benefits child health.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, 	√

⁷⁰ Source: Francisca Mate, James Atema and Questionnaire for University of Essex SAFE Research Database 2001

	households and community	
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	

2.2.10. LOMADEF, Lipangwe, Malawi⁷¹

In 1993, the challenge 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 objective of demonstrating the benefits of organic agriculture and to reduce dependence of smallholder subsistence farmers on artificial fertilizers; nurture a sense of self reliance among farmers; 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 1200 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 demonstrations that show affordable technologies are very attractive to smallholder farmers.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

2.2.11. Organic Cashews and vegetables in Mkuranga District, Tanzania⁷²

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'⁷³ and have

⁷¹ Source: Kanjanga,

⁷² Source: Petra Bakewell-Stone 2006

⁷³ Muungano means "union" in Kiswahili

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 internalisation of organic principles of production into the farming system have improved overall agroecosystem 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.

Social capital in the region between the 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 and cooperation between women around a common goal has created powerful momentum in the drive for community development. In addition to 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 organised, 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.

Whilst certification could have many advantages, it may not solve all farmers' problems. Whilst 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 of limited assistance

without a corresponding understanding about 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 organisations, 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 the concerned consumer.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.12. Soil and crop productivity improvements, EAT, Kenya⁷⁴

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 in most of the areas except West Pokot District where 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 2 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% 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 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.

This has resulted in more than 1000 farmers drawn from different farming communities 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 maize yields of 3414 kg/ha (71% increase in productivity), while bean yields have increased to 258 kg/ha (158% increase in productivity) as compared to traditional agriculture. There has also been an increased diversity of crops grown. These

⁷⁴ Source: Charles Wasonga, EAT Kenya.

results have led to broad reaching impacts on food and nutrition security, the natural environment, on communities, education and economy (see Box 6.)

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

- Increases in diversity in food crops available on farms has made diets more varied and has 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 sold and income used to pay school fees for farmers’ children and thus improved education
- Reduction in soil loss from farms following implementation of soil conservation techniques
- Increased soil health through soil organic matter accumulation following application of organic manures
- Cohesion within farming communities 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 reduced leading to an overall reduction in poverty within households

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

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	√

2.2.13. Organic agriculture Iganga District, Uganda⁷⁵

The Poverty Eradication through Environmentally Sustainable Technologies (PEEST) project has been implemented in the Iganga District of Eastern Uganda since June 1997 by Africa

⁷⁵ Source: Walaga and Kakinda 2002

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% living below the poverty level of one dollar per day) and food insecurity. The three-year Poverty Eradication through Environmentally Sustainable Technologies project (PEEST) was initiated in 1997 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 sustainable manner; facilitate communities in the District to improve food security and diets, and to increase 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 and raised environmental awareness in the community, equipped farmers with knowledge and analytical skills 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, improved soil fertility resulting in improved agriculture productivity. By improving soil fertility the demand for more land from forests and wetlands has been eliminated for those participating farmers. The new agroforestry 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 agrobiodiversity. 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 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. They 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

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets 	
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	

2.2.14. Mount Kenya Organic Farm (MOOF), Kenya⁷⁶

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 main goal is to "Tackle Poverty among Smallholder Farmers through Organic Trade.

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 certified organic farming technologies. 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 – Horticulture Development Centre and Earthoil. The Project targets production of certified organic Borage seeds for cold pressing into nutraceutical 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 US\$ 4.00 per Kilogram which has been negotiated and agreed upon by the buyer Earthoil Kenya Limited and Farmers Self-Help groups. Borage yields are estimated at 500-750 kg per acre and the cost of production is very minimal as compared to conventional agricultural technologies.

⁷⁶ Source: Peter Murage 2006

Income generated from the 30 acres of borage of this project in 2006 estimated Kshs. 4.5 Million (US\$ 64,000) coming into the Nanyuki community (80 smallholder farmers) over a period of 7 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 improved nutritional status from stocking Tilapia fish for consumption. Income generated from sale of organic oil crops is also hoped to provide for the 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. Borage attracts bees in large numbers and this is hoped that farmers will engage in production of organic honey, which, when marketing is well organised, will fetch good income market and help people to further add to their Borage income.

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	√
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	√
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

2.2.15. Pelum, Tanzania⁷⁷

Participatory Ecological Land Use Management-Tanzania (PELUM-Tanzania), is a network of civil society organisation 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 PELUM Association. The association was launched in 1995 and its headquarters is in Lusaka Zambia. PELUM also has CWGs in Kenya and Uganda. Currently PELUM-Tanzania has a total of 33 member organisations that have all 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 Member Organisations that work with the rural community in Tanzania.

The objectives of PELUM Tanzania are to develop capacity of member organisations through organising own training workshops; facilitate networking through farmer organisations; 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

⁷⁷ Source: Donati Alex Senzia 2006, PELUM Tanzania

infrastructure (roads, storage facilities, physical markets, communication etc) and allocation of 10% of national budget to agriculture and food security by 2010. PELUM-Tanzania also organises farmer exchange visits and networking days so that farmers can learn and exchange best practices in agricultural sector. During networking days, farmers' groups and networks through member organisations come together exhibit their produces, share experiences and skills in production, processing, storage and marketing of agricultural products.

In 2003, 4 field staff from PELUM Tanzania participated in a two weeks workshop on Organic farming and Marketing organised by PELUM Association with an aim to introduce member organisations to the potentials 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 organisations and farmers to meet with organic farming institutions in Tanzania to know more about organic farming (institutions such as EPOPA (Export Promotion of Organic Products from Africa), TOAM (Tanzania Organic Agriculture Movement) and Tancert (Tanzania Organic farming Certification association)).

Key benefits of case study

Improvement to:	Mechanism:	
Amount of available food	<ul style="list-style-type: none"> Increase in food produced Increase in yields of food crops/ livestock 	
Natural capital	<ul style="list-style-type: none"> Benefits to natural environment – soils, water, fertility etc 	
Social capital	<ul style="list-style-type: none"> Builds partnerships between groups Increased community cohesion and co-operation 	√
Human capital	<ul style="list-style-type: none"> Increase in knowledge and skills of farmers Health and education benefits to farmers, households and community 	√
Physical capital	<ul style="list-style-type: none"> Improvements to infrastructure and markets 	√
Financial capital	<ul style="list-style-type: none"> Increased incomes to farmers 	√

2.4 Discussion of Evidence

Evidence from both the secondary sources and the case studies highlighted in this report reinforce the view that food security is influenced by many different factors that vary from region to region and although an increase in yield 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 and can be seen in Box 7.

Box 7. Key improvements shown by case studies

Improvement to:	Mechanism:	Number of case studies which showed improvement (out of a	Percent %

		possible 15)	
Amount of available food	<ul style="list-style-type: none"> • Increase in food produced • Increase in yields of food crops/ livestock 	10	67
Natural capital	<ul style="list-style-type: none"> • Benefits to natural environment – soils, water, fertility etc 	14	93
Social capital	<ul style="list-style-type: none"> • Builds partnerships between groups • Increased community cohesion and co-operation 	14	93
Human capital	<ul style="list-style-type: none"> • Increase in knowledge and skills of farmers • Health and education benefits to farmers, households and community 	15	100
Physical capital	<ul style="list-style-type: none"> • Improvements to infrastructure and markets 	6	40
Financial capital	<ul style="list-style-type: none"> • Increased incomes to farmers 	12	80

- **Increase in food availability**

10 out of the 15 case studies (67%) reported increases in the food availability, either in terms of increased yields of crops and livestock productivity or by an increase in total food produced. The 500 farmers in some 1000 hectares, as part of the Community mobilisation against desertification (C-MAD) programme in Kenya have seen a doubling of maize yields - improving from about 2 to 4 t/ha for example.

Evidence from this study and others shows that yields from organic systems tend to be stable when converting from low-input systems (those that may have been by-passed by the “green revolution”); they can outperform traditional systems and can match and increase those yields of more conventional input intensive systems over time.

- **Benefits to the natural environment**

The vast majority of the case studies showed improvements to the natural capital base - their local natural environment, with 93% outlining benefits to soil fertility, water supply and flood control and biodiversity. The PEEST programme in Uganda which supports organic agriculture in the Iganga District for example, has seen 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, improved soil fertility resulting in improved agriculture productivity. By improving soil fertility the demand for more land from forests and wetlands has also been eliminated for those participating farmers.

- **Benefits to community, co-operation and partnerships**

Again, 14 out of the 15 case studies (93%) saw improvements to social capital as integral to their success. The formation of farmers’ groups and co-operatives 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 led to increased 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 and have come together and formed groups all associated under the umbrella of ‘Muungano’⁷⁸. Helping one another financially during difficult periods, such as with school fees and medical expenses,

⁷⁸ Muungano means “union” in Kiswahili

by opening savings accounts was one of the main motivations for the project and cooperation between women around a common goal has also created powerful momentum in the drive for community development.

EAT Kenya has seen more than 1000 farmers drawn from different farming communities directly trained through the project and 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.

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

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

Soil and crop productivity improvement project at EAT, Kenya has shown that the health of farmers has been improved, with the health risks of synthetic fertilisers been reduced or eliminated with the switch to organic farming. The health of farmer families has also been shown to improve with both the increase of food and the increased incomes from selling surpluses that have enabled access to healthcare. The CMAD project in Kenya has also seen improvements to child mortality in the project area.

- **Improvements to infrastructure and markets**

40% of case studies examined reported improvements to the physical infrastructure and improvements in markets. Access to markets has increased both for farmers who have been able to sell surpluses at domestic markets and for farmers who have been able to sell certified organic produce to international markets.

- **Increase of farmer and household incomes**

The majority of case studies were able to include improvements to the financial capital base in their successes. 80% of cases showed increases in farmer and household incomes as a result of becoming organic, going some way to decrease poverty levels and to increase regional food security. By adopting organic norms and practices farmers from SACDEP in Thika, Kenya, farmers have seen incomes rise as a result, up 40%, thus enabling farmers to meet basic needs such as paying school fees and medical expenses. Additional savings to organic farmers also occur as a result of no longer needing to purchase synthetic fertilisers and pesticides.

- **Summary**

A study in 2002 comparing organic initiatives to other sustainable but not organic projects⁷⁹ found a number of findings 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-

⁷⁹ Pretty 2002

organic systems focus on social capital building through groups and 97% of cases in the 2002 study and 100% 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 East Africa

2.5.1 Knowledge

Although many resource-conserving technologies and practices are currently being used in East 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, nor is it a simple model to be widely applied with time. Lack of information on agroecology and the necessary skills to manage diverse farming systems can be a major barrier to the adoption of organic agriculture⁸⁰.

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, so 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 fertilisers.

One of the reasons that these transition costs arise is that farmers must first invest in learning. As recent and current agricultural policies have tended to promote specialised, 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 information⁸¹.

In addition, lack of knowledge and information about organic agriculture among government bureaucrats and other influential actors in educational and research institutions, also leads to poor appreciation of the potential for organic and near organic agriculture in poverty eradication and tackling food security issues.

2.5.2 Support and infrastructure

The difficulties in disseminating information in remote and marginal rural areas in East 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 they lack knowledge, information sources, and technical support. Greater government investment in appropriate research and extension services would help overcome these constraints⁸².

⁸⁰ Pretty and Ward 2001, Röling and Wagemakers 1997, Pretty 2002

⁸¹ Orr, 1992; Röling and Wagemakers 1998; Bentley et al. 2003; Lieblin et al. 2004; Bawden 2005; Chambers 2005, Gallagher et al. 2005

⁸² Altieri 2002

East 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) organised into farmer groups and are being supported by organisations including KOAN, NOGAMU and TOAM or ii) where the commercial exporters meet certification costs they are able to access markets more easily, but for many the costs of certification systems and complying with international standards may also be prohibitive⁸³.

Another factor affecting farmers wanting to take advantage of the organic export market is the limited infrastructure in East Africa. Many companies who specialise 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 East 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 not consistent) and in perfect condition (with limited and inconsistent refrigeration facilities available). In order for farmers from Uganda, Kenya and Tanzania to compete in the international organic markets significant investment into supporting infrastructure is essential.

The lack of distinct domestic organic markets in Uganda, Kenya and Tanzania alike may seem to make the commercialised organic agriculture (monocropping) a high risk venture as it relies solely on the export market⁸⁴. However this is a problem not solely for organic agriculture as it is certainly the case for monocropping for non-organic production systems as well. Recently however, domestic organic markets are starting to flourish in East Africa.

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

It is not just farmers who lack the financial resources facilitate organic production and to venture towards the export market, there is also the problem of limited and uncertain funding for Development agents and NGOs involved in implementation of organic support programs within the farming communities also may lack the financial resources 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 sources⁸⁵.

⁸³ Wynen and Vanzetti 2002, Rundgren 2007

⁸⁴ Walaga 2005

⁸⁵ Smaling *et al.*, 1997

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's aspirations may precisely to 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 East Africa.

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

Organic agriculture that increases the assets base and the so the value and potential of the land may simply 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 East Africa are largely the same as those external factors that contribute to and exasperate food insecurity (see section 1.3). Particularly though, the high incidence of pest and diseases incidences on some species and in some areas may have limited the uptake of organic agriculture and of course climate - unfavourable weather conditions such as droughts may limit the spread of some the organic techniques to certain areas.

2.4.6 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. So 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 laid⁸⁶.

⁸⁶ Bunch and Lòpez 1996

The findings from this report suggests that the technical improvements leading to natural capital accumulation are being widely applied with organic agriculture development, but there remains a need to focus more on social capital and institutional development for building resilience and innovation capacity within communities, and aiding the spread of good practice in organic agriculture⁸⁷.

As indicated earlier in this paper, agricultural sustainability can contribute to increased food production, as well as making 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 and 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 development⁸⁸.

Although almost every country would now say it supports the idea of agricultural sustainability, the evidence points towards only patchy reforms. Few countries have given explicit national support for organic agriculture: Cuba has a national policy for alternative agriculture; Switzerland has three tiers of support to encourage environmental services from agriculture and rural development, and Bhutan has a national environmental policy coordinated across all sectors for example. Neither Tanzania, Kenya or Uganda have included organic farming in main agricultural policy and many policies still support input based, non-organic agriculture. However Kenya's catchment approach to soil conservation is evidence of reform of parts of its agricultural policy⁸⁹.

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 food security, sustainability and poverty-reduction aims should therefore adopt an approach with varying strands, one that emphasises aspects such as small farmer development linked to local markets; agri-business development (both small businesses and export-le and agro-processing and value-added activities to ensure that returns are maximised in-country.

2.5.7 In summary

.All case studies in this research where reliable data has been reported have shown increases in per hectare productivity for food crops, which goes against the popular myth that organic agriculture cannot increase agricultural productivity. Organic production allows

⁸⁷ Pretty 2002

⁸⁸ Dasgupta 1998, Altieri 2002

⁸⁹ Funes et al 2002; Pretty 2002; Herzog et al 2005

access to markets and food for farmers both to obtain premium prices for their produce (export and domestic) but also to use extra incomes to buy extra foodstuffs, education or healthcare. 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 increased incomes from export to buy food and as a result of higher on farm yields thus enabling the wider community to buy organic food at local markets.

Whether organic farming will result in enough food to meet all of the food needs in Africa and other developing countries can never be totally certain. However the same could be said for conventional farming systems (and those that rely on synthetic fertilisers and pesticides) who are clearly unable to fulfil the *current* food needs in Africa, and as a result there is widespread food insecurity. The results that we have seen for a transition to organic agriculture are nevertheless highly promising for food security in East Africa. There is also scope for additional confidence, as the evidence indicates that this productivity can grow over time if natural, social and human assets are accumulated⁹⁰.

Organic agriculture is therefore important for meeting local food requirements whilst i) providing protection and sustainable use of natural resources, ii) building up the knowledge and skills of farmers and iii) strengthening communities by the formation of groups and partnerships. Organic farming makes it possible to save on production costs (no expenditure on synthetic inputs), to encourage food self-reliance and to promote economic viability through access to markets. 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 shortages⁹¹.

⁹⁰ Borlaug 1994a, b; Avery 1995

⁹¹ Hine and Pretty 2001, Altieri 2002, Pretty *et al.* 2005, IFOAM 2006c

Section 3. Conclusions

- Integrated 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 in this research where reliable data has been reported have shown increases in per hectare productivity for food crops, which goes against the popular myth that organic agriculture cannot increase agricultural productivity. Organic production allows access to markets and food for farmers both to obtain premium prices for their produce (export and domestic) but also to use extra incomes to buy extra foodstuffs, education or healthcare. 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 increased incomes from export to buy food and as a result of higher on farm yields thus enabling the wider community to buy organic food at local markets.
- Organic and near organic agriculture methods and technologies are ideally suited for many poor, marginalised smallholder farmers in areas of Kenya, Uganda and Republic of Tanzania as they require minimal or no external inputs, use locally and naturally available materials to produce high quality products and encourage a whole system approach to farming that is more diverse and resistant to stress.
- Certified organic production for the export market, with its premium prices, can undoubtedly lead to a decrease in farmer poverty, 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 for the whole of an integrated agricultural system, as a holistic approach, then “organic” can be synonymous with “sustainable” and increased food security in a region is more likely to occur, at the same time as 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 East Africa and to the improvement of 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 East Africa and 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 scale up, an enabling policy environment is critical.
- Integrated organic agriculture, whether certified or non-certified, is more management and knowledge intensive, and so requires building the learning and cooperative capacity of individuals and groups. This will require investment in social capital development at local level if organic agriculture is to spread.
- We know much more about intensive high-input farming systems than we do about sustainable organic systems so more information on agro-ecological technologies is needed. However this needs an emphasis shift of research and science budgets and

the creation better linkages between scientists, agricultural training and extension providers and farmers.

- Partnerships between farmers, farmer groups, NGOs and CSOs, organic movement organisations, 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 from local to national and international levels, as well as to encourage more links between government, NGOs, and the private sector.
- Improving agricultural sustainability through adoption of organic agriculture in East Africa may not bring all the solutions, but promising progress has been made in recent years. Whether organic farming will result in enough food to meet current and future needs after continued population growth and development in African countries, whilst optimistic, can never be totally certain. However, the current situation of widespread food insecurity means that conventional farming systems clearly do not have all the answers either. The results that we have seen for a transition to organic agriculture are highly promising for food security in East Africa. There is also scope for additional confidence, as the evidence indicates that this productivity can grow over time.⁹² With further specific support, these 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.

⁹² Borlaug 1994a, b; Avery 1995

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Annex A. Key Organic Stakeholders

Kenya	Uganda	Tanzania
<ul style="list-style-type: none"> • ABLH – Association for Better Land Husbandry • Baraka Agricultural College • Bungoma Family Development Programme • ICIPE – International Centre of Insect Physiology and Ecology • ICRAF – International Centre for Research in Agroforestry • ITDG Kenya – Intermediate Technology Development Group • KARI - Kenya Agricultural Research Institute • KARI – Kenya Agricultural Research Institute • KIOF - Kenya Institute of Organic Farming • KOAN- Kenyan Organic Agriculture Network • Manor House Agriculture Centre • OFOP - Organic Farming Outreach Programme • PELUM Kenya • SACDEP - Sustainable Agriculture Community Development Programme • SACRED-Africa - Sustainable Agriculture Centre for Research and Development in Africa 	<ul style="list-style-type: none"> • Bufumbo Organic Agriculture Producers Association • CIOF – Ceres Institute of Organic Farming • COOPIBO-Uganda • Environmental Alert • EPOPA - Export Promotion of Organic Products from Africa • International Centre for Tropical Agriculture, • Kayunga organic Agriculture producers Association • KOFT – Organic Farm and Training Centre • LOFP – Lango Organic Farming Production • Masaka Organic Producers • NOGAMO – National Organic Movement of Uganda • Nombe Organic producers Association • PELUM Uganda • RUCID - Rural Community in Development • SANU - Sustainable Agriculture Net of Uganda • Uganda Centre for Sustainable Agriculture 	<ul style="list-style-type: none"> • COOPIBO-Tanzania • EPOPA TZ- Export Promotion of Organic Products from Africa • INADES – Formation • KCU - Kagera Cooperative Union • KIHATA – Chama Cha Kilimo Hai Tanzania • KNCU – Kilimanjaro Native Cooperative Union • Laela Agricultural Centre • PELUM Tanzania • TOAM – Tanzania Organic Agriculture Movement • TOFO – Tanzania Organic Foundation • TOPP - Tanzania Organisation of Permaculture Promoters