International Federation of Organic Agriculture Movements

Organic Agriculture and Food Security

Dossier 1

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CONTENT

Executive Summary

While affluent regions and social classes struggle with surplus production and surplus consumption, close to one fifth of the global population lives in constant under-nourishment. Subsistence production of basic foods is restricted in many regions by lack of access to capital, land and water. At the same time, more favoured growing areas are used for commercial production of speciality crops or animal feeds for export to affluent regions. The major constraints to food security are found in social, economic and political conditions rather than in production methods themselves. The main solutions to food security problems will therefore be found in social, economic and political improvement.

Nevertheless, demand for food will increase in the future so there are reasons why production issues and the relevance of organic agriculture need to be addressed:

- The main strategy for increasing both food production and access to food is through increased production by farmers in developing countries.
- Conventional agriculture may give short-term gains in production, but in most cases it is not sustainable in the long term, nor does it guarantee safe food.
- In particular, conventional production methods are inadequate for disadvantaged farming communities and are thus not a suitable solution for many of those who face food shortage.
- Organic production has the potential to produce sufficient food of a high quality. In addition organic agriculture is particularly well suited for those rural communities that are currently most exposed to food shortages.
- Organic agriculture contributes to food security by a combination of many features, most notably by:
  - Increasing yields in low-input areas
  - Conserving bio-diversity and nature resources on the farm and in the surrounding area
  - Increasing income and/or reducing costs
  - Producing safe and varied food
  - Being sustainable in the long term

Organic agriculture should be an integral part of any agricultural policy aiming for food security.

Definitions and current situation

Organic agriculture

Definition

Organic agriculture is well defined in a number of documents, most notably by the International Federation of Organic Agriculture Movements, IFOAM:

"Organic agriculture includes all agricultural systems that promote the environmentally, socially and economically sound production of food and fibres. These systems take local soil fertility as a key to successful production. By respecting the natural capacity of plants, animals and the landscape, it aims to optimise quality in all aspects of agriculture and the environment. Organic agriculture dramatically reduces external inputs by refraining from the use of chemo-synthetic fertilisers, pesticides, and pharmaceuticals. Instead it allows the powerful laws of nature to increase both agricultural yields and disease resistance. Organic agriculture adheres to globally accepted principles, which are implemented within local social-economic, climatic and cultural settings. As a logical consequence, IFOAM stresses and supports the development of self-supporting systems on local and regional levels." **(IFOAM 2000)**

Organic agriculture may also be known as ecological or biological agriculture or by similar names in languages other than English.

The Principle Aims of Organic Production and Processing

Organic Production and Processing is based on a number of principles and ideas. They are all important and are not necessarily listed here in order of importance.

- To produce food of high quality in sufficient quantity.
- To interact in a constructive and life-enhancing way with natural systems and cycles.
- To consider the wider social and ecological impact of the organic production and processing system.
- To encourage and enhance biological cycles within the farming system, involving micro-organisms, soil flora and fauna, plants and animals.
- To develop a valuable and sustainable aquatic ecosystem.
- To maintain and increase long term fertility of soils.
- To maintain the genetic diversity of the production system and its surroundings, including the protection of plant and wildlife habitats.
- To promote the healthy use and proper care of water, water resources and all life therein.
- To use, as far as possible, renewable resources in locally organised production systems.
- To create a harmonious balance between crop production and animal husbandry.
- To give all livestock conditions of life with due consideration for the basic aspects of their innate behaviour.
- To minimise all forms of pollution.
- To process organic products using renewable resources.
- To produce fully biodegradable organic products.
- To produce textiles which are long-lasting and of good quality.
- To allow everyone involved in organic production and processing a quality of life which meets their basic needs and allows an adequate return and satisfaction from their work, including a safe working environment.
- To progress toward an entire production, processing and distribution chain which is both socially just and ecologically responsible.

(IFOAM Basic Standards 2000)

Organic agriculture is the only agricultural production method that is based on international standards, i.e. the IFOAM Basic Standards that have existed for 25 years. During the 1990s CODEX Alimentarius (a joint FAO/WHO body) also developed international organic guidelines. There are no major differences between these sets of standards.

Current situation

Broadly speaking there are two different kinds of organic farms in the world:

1. Certified organic farms producing for a premium price market.
2. Non-certified organic farms producing for their own households and for local markets.

Most of the certified farms in category 1 are in developed countries; and most other farms in category 2 are in developing countries. Where production is for own consumption or for local sales there is no real need for certification or any other procedure to register the farm as organic. Many of the non-certified farms practice farming that is essentially organic, but may not always comply with all the details in the standards. These systems are often referred to as agro-ecological. There are reasonably comprehensive statistics regarding the extent of certified farms, but there is little data available for the extent of the non-certified farms. It is probably fair to assume that the extent of non-certified organic production is as large as certified production.

In total there are more than 20 million hectares of certified organic land today. The countries with the largest areas of organic farmland are: Australia, Argentina, Italy, Canada and USA. Some countries have reached a substantial proportion (close to or more than 10%) of organic land; these include Sweden, Austria, Switzerland, Finland and Italy. The value of the organic market is approximately US$ 20 billion. The market share for certified organic products lies between 0.5-4% in industrial countries with the highest market share in Denmark, Austria, Switzerland, Germany and Sweden. (Willer and Yussefi 2000, Grolink 2001, ITC 2001).

Food security

Definition

"Food security exists when 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." World Food Summit 1996

Current situation

Over the past 40 years, per capita world food production has grown by 25%, and food prices in real terms have fallen by 40%. 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 year (Pretty and Hine 2000).

In the year 2000, there were 790 million hungry people. Despite progress on average per capita consumption of food (up 17% in the past 30 years to 2760 kcal), people in 33 countries still consume less than 2200 kcal per day (Pretty and Hine 2000).

At the same time 1.2 billion people are over eating (Worldwatch Institute 2000).

"There is enough for everybody's need but not enough for everybody's greed"
Mahatma Gandhi

Reasons for lack of food

> *"Nearly 80 percent of all malnourished children in the developing world in the early 1990s lived in countries that boasted food surpluses."*
> State of the World 2000

Where are the solutions to food security to be found? There is no lack of food on a global scale, yet people are still starving. Also *within* many countries there is no lack of food production and yet people are still starving or are under-nourished. It is apparent that **sufficient food supply and production does not mean sufficient food for all**. What is more important is **who** produces the food, **who** has access to the resources, the technology and knowledge to produce it, and **who** has the purchasing power to acquire it.

"Starvation is the characteristics of some people <u>not having</u> enough food to eat. It is not the characteristic of there not <u>being</u> enough food to eat"
Amartya Sen

<u>The causes of starvation and malnutrition are mainly social, political and economic</u>

The major reasons for lack of food security are to be found in the social-political-economic arena. Most prominent are:

- Poverty, inequality and discrimination (on the grounds of class, ethnicity, age, sex etc.) - lack of money to buy food or lack of access to resources to produce food, such as access to land, access to inputs and water or access to credits.
- War or civil unrest
- Food production fails to deliver economic returns. The lack of a developed food market gives farmers no incentive to increase production.

> *More than half of the world's food is produced by women, and in rural areas in developing countries as much as 80 percent. Yet women have little access to land, credit, training and education. In five African countries Kenya, Malawi, Sierra Leone, Zambia and Zimbabwe women receive less than 10 percent of the credit awarded to smallholder farmers and just 1 percent of agricultural credit overall.* (FAO 1998)

Other factors are lack of labour, or lack of healthy labour, bad governance, lack of distribution capacity, bad infrastructure and government policies that discourage food production.

> *The total agricultural subsidies in the OECD countries rose to approximately US $ 250 billion (Jordbruksverket 2000). In the same time in most developing countries direct and indirect taxation of agriculture usually brings about a net transfer of resources out of the agricultural sector*
> (FAO 2000).

Global trade relations and rules, international and national policies, structural adjustments and trade concentration affect food security in a number of ways. The imbalanced terms of competition between producers in industrial countries and developing countries has put a major strain on production in developing countries. Most direct effects are caused by the dumping of export surpluses which leads to lowered prices in developing countries thereby lowering production. It is often more profitable in developing countries to produce speciality crops for an export market with high purchasing power than for a domestic market with low purchasing power and low prices for staple food crops.

Food security issues are very complex, and cause and effect are not easy to clarify. What is good for one group is not necessarily good for another group. Increased prices for food crops will quite certainly lead to an increase in production of food. However, higher food prices may be unbearable for the urban poor. At the same time, better economic conditions in

agriculture would have kept many of the people now dwelling in urban slums in the rural areas.

Production issues also play a role

While it is clear that **the main causes of starvation and malnutrition are not to be found in the area of production**, there are a number of production related factors to consider. Most prominent are:

- Unsustainable production methods – erosion of soil, depletion of fertility and groundwater, poisoning of land and water, salination and water-logging
- Loss of bio-diversity on the farm (seeds, breeds etc.) and degraded surrounding environment
- Non efficient use of production resources (non or under-utilised natural resources). This is often the case when land is distributed in large units, or when markets are not encouraging farmers to produce sufficiently
- Natural disasters

Future challenge

Food demand will both grow and shift in the coming decades for three reasons:

- Increasing numbers of people means that the absolute demand for food will rise. Despite steadily falling fertility rates and family sizes, the world population is expected to grow to 8.3 billion by 2025. By this time, 84% of people will be in those countries currently making up the 'developing' world.
- Increasing incomes mean people will have more purchasing power to buy more food.
- Increasing urbanisation means people will be more likely to adopt new diets, particularly consuming more meat, eggs and dairy products - demand is expected to double by 2020 in developing countries, and to increase by 25% in industrialised countries, resulting in a total and per capita increase in demand for cereals (Pretty and Hine 2000)[1].

The quantity of grain used for animal feed would be sufficient to supply 2.5 billion persons (Gräfelfinger Thesen, Naturland 1996).

It is clear that *today* the main reason for malnutrition is not to be found in the lack of food. At the same time, the demand for food is growing. In addition, there are increasing expectations that agriculture shall also be a producer of energy (e.g. bio-gas, oils or alcohol as fuel), industrial raw materials, fibres and services (tourism, landscape, carbon sequestration etc.). Sooner or later production capacity will become a real limiting factor. With this perspective we need to ask the questions: **where** will the food be produced? **How** will it be produced? And **who** will produce it? This paper examines the question of whether **organic agriculture can produce sufficient food, and in particular whether it is the best option for farmers in developing countries.**

1 By shifting global diets to vegetarian or vegan food, substantially more people could be fed on the same area of land.

Scenarios and choices for increased production

Considering the increased demand for food in the future there are three main options to increase production:

- Area expansion
- Increased productivity in industrialised countries and export of surpluses
- Increased productivity in developing countries

Obviously the options are not mutually exclusive. However, there is a need to understand which option could form the main strategy.

Area expansion

One option for increasing production could be to expand the area used for agriculture, by converting new lands to agriculture. Substantial agricultural areas are **lost** due to construction, desertification, salinisation, waterlogging and erosion. Figures from OECD countries (OECD 2001) and many developing countries show a decline in agriculture areas rather than the opposite. An expansion of the area used for agriculture may only balance this loss. In addition, with some exceptions, the most suitable land is already taken into production (Pimentel 2000, FAO 2000). Agricultural expansion is likely to push already marginalised people into the role of "pioneers" to cultivate these new less fertile lands (e.g. rain forests), which will only further confirm their poverty and marginalisation.

This strategy would also result in agriculture occupying even more land and an even greater expansion of human domination over global ecosystems. It will result in even greater bio-diversity losses than we have already experienced. Apart from the ethical question of whether we have the right to utilise even more resources at the expenses of other species, the result is also that ecosystem services from forests, grasslands and other areas of important bio-diversity are lost. This threatens our future survival. Therefore **the option of area expansion is not a globally acceptable approach**, even though it may be applicable in some areas. What is more important is to maintain fertility on existing land and to restore fertility on degraded lands, approaches where organic agriculture is specifically relevant.

Increased productivity in countries with high potential and export of surpluses

The second option for increased production is to increase production per hectare in agricultural exporting countries (mostly industrialised), so that food can be transferred or sold to those who need it. **This is not a viable solution** for several reasons:

- The people who are short of food have no money and are not able to buy food in any case. Food aid is not likely to increase. In reality it has decreased in recent decades.
- The pressure on the environment and on bio-diversity and the external cost of conventional farming in developed countries is already far too high and there is a need for a radical change in the production systems of the industrialised countries. This is likely to result in lower rather than higher levels of production.
- Our food production system needs to re-cycle nutrients in order to become sustainable. Large scale transport of food from one part of the world to another is undermining efforts to close the nutrient cycles. Soils are mined in some parts of the world and in other parts of the world the concentration of nutrients are creating environmental problems.

> *Agricultural soils are degraded - fifty percent or more of the natural nutrients and organic matter from much of Canada's once rich prairie soils have been lost in a century of mechanised export agriculture – and we are forced to substitute non-renewable artificial fertilisers for the once renewable real thing.*
> (Rees and Wackernagel 1996)

- There is little reality in the idea that the 'surplus' workforce in developing countries, not needed to produce food as it is imported from abroad, will find suitable occupations in other sectors. The social implications of even further marginalising the poorest will be unacceptable from a humanitarian perspective and also non sustainable from a social/political perspective.
- The energy consumption that an even larger-scale global food trading system will result in will not be sustainable. We need to lower global energy consumption – not to increase it. In particular it should not be increased in those countries that are already consuming most of our energy resources.
- The large-scale distribution system is too vulnerable to disturbances from price fluctuation caused by energy crises, war, civil strife etc. In addition, distribution to the rural poor is costly and sometimes risky.

To some extent the current global trade in agricultural products is a result of a distorted trading system. 'Surplus' production in some countries is to a large extent imaginary, e.g. the exports of surpluses from the European Union are balanced by comparable imports of feed stuff (Einarsson 2000). Although there will always be a need and a role for international trade in agricultural products, it should be in value-added products or in high value commodities rather than in staple foods, something that is again undermined by unfair trade rules (tariff escalation etc.).

Increased productivity in developing countries

The third option for increased production is to increase total farm productivity in those developing countries most in need of food. In some developing countries there are agriculture areas with high potential. In many of these areas export oriented production with high levels of external inputs has been established. This production has mostly not benefited the poor, and is often carried out by large companies or plantations. In addition, the sustainability of this production is questionable. As will be shown below, conventional agriculture is not a feasible option for increased productivity in developing countries.

The central issues are, therefore, the extent to which farmers can improve food production with cheap, low-cost, locally-available technologies and inputs, and whether they can do this without causing further environmental damage. There is a growing consensus that this strategy is the most feasible, especially if it targets the smallholder sector. Small farms are generally more productive (per area unit) than large farms (Rosset 1999). By increasing the productivity of small farms, not only will there be more food produced by those who need it most, but small holders and rural communities can also be lifted out of poverty. **Organic agriculture fits very well into this strategy** as will be shown below.

It must be realised that farmers will only increase production if there is a market for their products. Food is produced by farmers not to demonstrate how much can be grown, but to make economic use of it – to eat, to sell, to exchange. We cannot directly infer how much can be produced merely by looking at what is actually produced. Food production will not extend beyond the limit of effective demand (Sen 1994). Therefore this strategy must be combined with other poverty alleviation measures to ensure a proper demand for food in developing countries. Also, national and international policies and the terms of trade need to be changed to stimulate the development of local markets.

Conventional agriculture is not the right choice for increasing productivity in developing countries

Conventional agriculture has failed to deliver food security

The introduction of synthetic chemical fertilisers and pesticides has boosted production output per hectare in most cases; i.e. the Green Revolution has resulted in a higher production. However, the increase in production that has been witnessed has slowed down and in some cases there are indications that production is going down. The main reasons for this are:

- Decreasing soil fertility.
- Damage to bio-diversity and the environment.
- Degradation or destruction of water resources.
- The build up of pest populations and resistance.

> *"In India 30% of the arable land is irrigated and under intensive production with Green revolution high input agriculture. However these lands are showing a decreasing trend in productivity. 70% of the arable land is dry land with low soil fertility where small and marginal farmers practice traditional agriculture, High external input has very little to offer in improving productivity of these marginal soils. Under the pressure of high costs of production, purchased inputs and increasing debts, many impoverished farmers have committed suicide in two southern states of India."* (Mahale 2001)

Moreover the success of industrial agriculture and the Green Revolution in recent decades has often masked significant externalities, affecting natural resources and human health, as well as agriculture itself. Environmental and health problems associated with agriculture have been increasingly well-documented, but it is only recently that the scale of the costs has come to be appreciated. E.g. the external costs of agriculture in the UK have been estimated as £1.1-3.9 Billion per annum (Pretty et al 2000). As the external costs of farming are not internalised in the price of food, tax payers - or more likely, future generations - will pay the bill that is getting bigger every day.

The system error

The root cause of the problems in conventional farming is that the introduction of chemical fertilisers and pesticides has stimulated a production system that tries to be independent of natural regulating processes and local resources, and that is heavily dependent on non-renewable resources. It has stimulated mono-cropping and regional specialisation in the food system. This leads to more pests and increased problems with nutrient management, as natural cycles are broken. To fix the problems even more pesticides and more chemical fertilisers have to be used – a vicious circle is established.

Long term effect on fertility of soils and soil erosion

More difficult to assess than other factors, but perhaps most important, is the long term effect on the fertility of soils. As we are dealing with a wide variety of soils as well as many different production systems, it is difficult to make general statements – but there are clear indications that fertility is dropping, and that farmers try to compensate by increased fertiliser applications. This is aggravating the problem, as one of the reasons for the decline in fertility is the lack of proper management of the soil organic matter. When synthetic fertilisers replace more natural ways of nutrient management – such as crop rotation, recycling of organic matter and the integration of animals and crop production – soil organic matter is eroded. When organic matter is lost the soil becomes more vulnerable to physical erosion by wind or water, the water retention capacity is diminished and nutrient uptake harmed. Tillage and cultivation practices add to soil erosion problems.

Reduced food safety and negative health effects

The use of pesticides in agriculture is a major health hazard in developing countries, in particular for the farmers and farm workers. According to the WHO, 20,000 deaths are unintentionally caused by pesticides (220,000 deaths when use of pesticides for suicides etc. is included.), most of these are in developing countries. 3 million people suffer from severe acute poisoning matched by a greater number of unreported cases (WHO 1990). More recent data from various countries indicate that these figures are hardly exaggerated – rather the opposite. The long term effects of lower levels of a broad range of different pesticides in our food are not fully known, but it is a fair assumption that there may be considerable risks. In addition, the use of chemical fertilisers often leads to a higher content of non-desirable substances in food, such as higher nitrate content which is linked to the use of nitrogen fertilisers, and cadmium as a result of contaminated phosphates.

The health costs for pesticide use in Nueva Ecija, Philippines, were estimated as US$ 20 – US$ 200 per hectare, depending on the number of applications. When compared to production without any pesticide use, the net benefit per hectare was lower the more pesticides were used. (Rola and Pingali 1993)

Decreased nutritional values and deterioration of diets

The increase in production incurred by increased used of fertilisers coupled with new varieties specially developed for a more intensive system has lead to a dilution of essential micro-elements, reduction of protein quality, reduced shelf life etc. A change in diet caused by the comparative advantage of Green Revolutions crops and varieties over traditional crops and varieties also contributes to a reduced nutrient density of food. In addition, the monocultures that are a result of the new technologies are leading to a less varied diet, causing malnutrition.

The substitution trend of domestic coarse grains by non traditional grains has serious short and long-term implications on food security in Africa. The substitution is occurring most rapidly in countries where rice and wheat production is either costly, not feasible or both, and these countries have low per capita incomes and severe foreign exchange constraints.
(Salih 1995)

Loss of bio-diversity and environmental degradation

Bio-diversity is affected at three levels:

- In the crops or breeds themselves (genetic diversity)
- In the diversity of farm production
- In the surrounding areas.

Farmers of traditional and low input systems have favoured diversity on the farm. The introduction of mono-cropping, and modern varieties and breeds has resulted in some 75 percent of the genetic diversity of agricultural crops being lost during the twentieth century. (Pretty 1995).

The effects of the combination of pesticides and mono-cultures on on-farm bio-diversity are quite obvious. The effects of pesticides and chemical fertilisers are also spreading to non-farm areas. This takes place both directly through spray drift and leaching, but also as a result of fewer wildlife habitats and less food for wildlife in the farm environment. As the 2000 IUCN *Red List* of threatened species highlights, habitat loss is the main threat to bio-diversity, with agricultural activities affecting 70 per cent of all threatened bird species and 49 per cent of all plant species.

In a study of cotton production in the USA it was concluded that the estimated environmental subsidy of ecosystem services to cotton farming is USD 2.54-2.69 per kilogram cotton produced. Of this, ecosystem services worth USD 0.62-0.67 per kilogram cotton produced are depleted.
(Hård af Segerstad 1999)

One of the most obvious direct negative effects of conventional agriculture is pollution of water with nitrates, phosphates and pesticides. 60 percent of all nitrogen fertilisers applied are not taken up by the plants but are lost, mainly to ground or surface water (OECD 2000). Nitrate levels in drinking water are rising. Pesticides are now found in groundwater in most places in the world. Apart from the poisoning of aquatic organisms, this contamination incurs high costs arising from the need for water purification, damage to crops and the costs related to health care.

'New' solutions?

The bio-tech industry is now promoting genetic engineering with arguments identical to those of the earlier Green Revolution. As with all new technologies it is difficult to prove that they are harmless or harmful until after they have been used for a longer term. But in this case that may be too late! There are many reasons to resist the introduction of GMO crops, since there are no convincing benefits associated with the technology (except, of course, for the companies producing them) but there are a large number of risks and disadvantages that have already been identified such as:

- Agricultural risks – erosion and pollution of the genetic base, creation of super weeds, development of resistance
- Environmental risks – affecting non-target organisms – cross over of genes
- Undermining alternative methods – e.g. the introduction of Bt crops is a threat to the moderate use of Bt by organic farmers, as the Bt crops are likely to induce resistance
- Health risks – allergy potential and undesirable compounds in food
- Dependency on seed companies – reducing the farmers' control of their own seeds
- High costs

GMO crops are particularly inappropriate for poor countries and poor farmers

In addition to the general concerns outlined above, genetic engineering is even less appropriate for developing countries:

- The development of GMO crops requires massive investment in research. Consequently it drains resources from much needed research in the development of low cost alternatives.
- Poor countries do not have the capacity to carry out the impact assessment, testing and monitoring that growing GMO crops will necessarily entail.
- Because of the high costs, GMO crops will be more expensive. Poor farmers cannot afford to buy new seeds every year. Their production system depends on saving their own seeds - with occasional exchange or renewal, - not on yearly purchase of expensive patented seeds.
- The 'solutions' offered by GMO crops are largely irrelevant to the barriers to increased productivity that poor farmers face.

'You cannot solve the problem with the same kind of thinking that created the problem'
Albert Einstein

Organic agriculture and food security in developing countries

A growing number of farmers, NGOs, politicians and development experts have realised that instead of the capital- and chemical input-intensive approach, we should favour an agriculture that emphasises bio-diversity, recycling of nutrients, synergy among crops, animals, soils, and other biological components, as well as regeneration and conservation of resources. Organic agriculture is doing exactly this. The solutions delivered by organic agriculture should not be seen as isolated technologies but the result of the implementation of a whole farming and food system. One of the main features of organic agriculture is how well it integrates a number of important issues. Even if there are other solutions to each individual problem, there is no other solution that to such a large extent addresses most of the current problems facing rural communities.

The question of whether organic agriculture can provide and how it will deliver accurate food security is complex. The main relevance of organic agriculture is that:

- Organic agriculture can increase productivity, especially in those situations where farmers are most prone to food shortages
- Organic agriculture can produce safe food and supports a varied diet
- Organic agriculture can increase income and/or return on labour
- Organic agriculture can reduce costs of production
- The diversification of production that follows reduces both the risk of crop failures and their effects
- Organic agriculture makes farmers and consumers more aware of the need for sustainable production and consumption, of the importance of clean and safe food and of the need to protect the environment
- Organic agriculture recognises the value of traditional and indigenous knowledge and integrates this in its production methods.
- Organic agriculture is sustainable in the long term.

Organic agriculture can increase farm productivity and provide a varied and safe diet

Will production increase or decrease when farms are converted to organic agriculture?
It is not possible to make simple statements about production levels and potentials. In many cases there will be a drop in production after the start of conversion. This will be most marked in situations where the previous system has depended heavily on agrochemicals. An overview of how a conversion to organic agriculture will affect yields indicates the following:

- In the kind of conventional agriculture practised in most rich countries conversion to organic agriculture normally leads to yield reduction, often in the range of 5-20%.
- In Green Revolution agriculture (irrigated lands) conversion to organic agriculture may lead to equal yield.
- In ‘traditional’ agriculture in rain-fed areas, organic farming normally leads to increased yield.

The increased productivity associated with conversion to organic production arises from one or more of the following mechanisms (see more under Case studies):

- Improved diversity in the agricultural system through crop rotation, intercropping and polycultures
- The use of green manure crops either separately or intercropped
- Improved on-farm re-cycling of nutrients by utilisation of crop residues as mulch or through composting and non burning

- Better use of organic materials in the surrounding eco-systems and recycling by-products from the food industry
- Better use of natural resources, especially water (by mulching, water harvesting, and through the increase in soil organic matter)
- Integration of livestock and crops, leading to improved nutrient management
- More attention to soil and nature conservation

As a result of an increased diversity in production organic agriculture will normally lead to a more varied diet for farm families and farm workers.

The major critique raised against organic farming by conventional agronomists is that it is not sustainable in the long term when it comes to nutrient management, i.e. that chemical fertilisers are needed to replace the nutrients that are taken away from the soil. In theory this argument may have some merit, but in practice, the long-term experience of organic farms is contradicting this. There is no evidence that soils are depleted of nutrients on farms that have been organically managed for decades (up to 70 years); on the contrary they normally show an increase in soil organic matter, available nutrients and fertility.

Limitations

The introduction of organic agriculture *alone* cannot solve all production problems. For example, in most cases organic agriculture offers the most practical way to restore agricultural lands that have been degraded by conventional practices; however, where soils and the surrounding natural area is severely degraded, the implementation of organic agriculture alone will not be a guarantee of increased productivity. In these cases there is a need to combine the introduction of organic agriculture with landscape reconstruction and targeted bio-diversity remediation.

Organic agriculture is an innovation that integrates traditional and indigenous farming knowledge

Possibly the greatest impact of organic agriculture is on the mindset of people. It connects to traditional and indigenous farming knowledge while introducing selected modern technologies to manage and enhance diversity, to incorporate biological principles and resources into farming systems, and to ecologically intensify agricultural production. Instead of being an obstacle to progress, traditions may become an integral part of progress. By adopting organic agriculture farmers are challenged to take on new knowledge and perspectives and to innovate. This leads to an increased engagement in farming, which can trigger further improvements. Through the emphasis on local resources and self reliance, conversion to organic agriculture contributes to the empowerment of farmers and local communities.

Organic Agriculture is a means to increase income

There are at least four mechanisms, whereby organic farming can improve income, profitability and return on labour.

- By removing or reducing the need for purchased inputs
- By diversification and optimising productivity
- By maintenance or improvement of on-farm and off-farm bio-diversity
- By sales on a premium market

Reduction of inputs and costs of inputs.
For small holders in developing countries the cost of inputs is a major expense and in many cases this is financed by high interest credit. Organic agriculture is based on local resources and recycling of nutrients. Therefore most organic farmers will use considerably less inputs than conventional farmers in similar situations. To a certain extent these reduced costs are replaced by increased labour (e.g. manual weeding or composting). It is very rare that the costs of increased labour are higher than the costs of inputs. Therefore organic farming is often more profitable, especially in countries with low opportunity costs for labour.

In a comparison of 16 organic and 7 conventional farms in Southern Brazil the profitability of organic grape cultivation was higher than for conventional production while the results for maize, beans and onions were recorded to be the same in organic production as in conventional. No premium price was achieved for organic products (Helmfrid 1996).

Diversification.
The diversification that is often linked to a conversion to organic agriculture can in itself lead to increased income (or reduced expenses). Typical examples are:

- Addition of an extra single component of the farm system (with little change to the rest of the farm) – such as a home garden production, introduction of fishponds or a dairy cow.
- Addition of a new productive element to the farm system, such as duck or fish in rice paddy fields, or fruit trees planted on field boundaries which provide a boost to total farm food production, without necessarily affecting cereal productivity.
- Addition of products derived from green manure crops, shade trees or other components typically associated with organic farming

Maintenance or improvements of on-farm and off-farm bio-diversity.
By protecting or improving on-farm bio-diversity and the surrounding natural areas, organic farmers are able to utilise and/or market 'wild' or non-cultivated crops, insects, animals etc, such as medicinal herbs and insects, mushrooms, fruits etc. Those products may also provide an income opportunity for the landless rural poor. In addition they can contribute to the diet.

Sales on a premium market.
In addition to its advantages as a means of producing food for farming communities themselves, organic agriculture also has a substantial potential to offer increased income in the production of premium priced crops for a demand driven organic market. In many cases, farmers are not farming to their full potential, as there is simply no market for their products. This forces farmers into a vicious circle, where farm activities are just kept to the level of self-consumption. However no monetary income and production at a basic level for self-sufficiency is a very risky position for a rural household. Sudden illness, adverse weather conditions *etc.* can push the family into starvation. Therefore the possibility to sell organic products for a premium price can be very relevant.

There are a number of successful projects involving exports of organic production, where farmers' income has increased by 20-30% or more. Examples include the export of organic coffee, cotton, sesame etc. Naturally export production should not compete with the production of food for local markets, but there is not always a contradiction between export marketing and local food production. Many of these crops are also grown in a rotation with other food crops (cotton with corn, millet, beans etc.) or by a system of intercropping with food crops (coffee with bananas, other fruits etc). In this way such projects can both improve income and safeguard local consumption (See more under the case studies from India and Mexico).

IFOAM is encouraging the development of local and regional markets, both in developed and developing countries. Domestic marketing of organic food in developing countries is currently expanding rapidly in countries such as Costa Rica, Brazil, the Philippines and Thailand (Grolink 2001).

Organic agriculture - sustainability put into practice

As been shown above, organic agriculture is clearly a more sustainable production method than conventional farming. Currently there are three different approaches to the development of organic agriculture in developing countries:

- A development approach for resource poor communities, mainly oriented to self-sufficiency and community development.
- An income generation approach, giving farmers access to a premium market.
- A nature conservation approach where organic agriculture is seen as a tool for bio-diversity protection, nature conservation and natural resource management.

Simply put, these three approaches emphasise the three aspects of sustainability:

- Social sustainability
- Economic sustainability
- Environmental sustainability

Organic agriculture is not *only* about self-sufficiency or *only* about nature conservation or *only* about premium markets. Even though the entry point may be different, there is no fundamental contradiction between these different approaches. IFOAM's opinion is that they can and should be joined-up in practice. By properly integrating all aspects of sustainability organic agriculture can become even more truly sustainable than at present.

Case studies: the potential of Organic Agriculture to increase productivity, increase income or food security in developing countries

Below are some examples of successful organic approaches. In some of the case studies production may not be fully to organic standards, even though they take an organic approach. In the case of production for local markets or for self-consumption, organic agriculture is not defined through standards but rather by the system approach:

Madagascar: System of rice intensification (SRI)

The System of Rice Intensification (SRI) has been promoted since 1990 by the Tefy Saina Association, and has been evaluated by the Cornell International Institute for Food, Agriculture and Development. The system has improved rice yields from some 2 t/ha to 5, 10 or even 15 t/ha on farmers' fields. This has been achieved without having to use purchased inputs of pesticides or fertilisers. It is estimated that some 20,000 farmers have now adopted the full SRI in Madagascar. Cornell has helped research institutions in China, Indonesia, Philippines, Cambodia, Nepal, Ivory Coast, Sri Lanka, Cuba, Sierra Leone and Bangladesh locally to test SRI. In all cases, rice yields increased several fold. In China, for example, yields of 9-10.5 t/ha were achieved in the first year (compared with a national average of 6t/ha).

Uphoff, 2000a, b in Pretty and Hine 2001

Peru: Vitalising indigenous knowledge
NGOs in Peru have studied pre-Columbian technologies in search of solutions to contemporary problems of high-altitude farming. A fascinating example is the revival of an ingenious system of raised fields surrounded by ditches filled with water that evolved in the Peruvian Andes about 3,000 years ago. These *waru-warus* were able to produce bumper crops despite floods, droughts, and the killing frosts common at altitudes of nearly 4,000 meters. The combination of raised beds and canals moderates soil temperature, thereby extending the growing season and leading to higher productivity on the *waru-warus* than on chemically fertilised normal pampa soils. In the district of Huatta, the *waru-warus* have produced annual potato yields of 8-14 metric tons per hectare, contrasting favourably with the average regional potato yields of 1– 4 metric tons per hectare.
Miguel A. Altieri, Peter Rosset, and Lori Ann Thrupp, IFPRI 2020 brief 55, October 1999

Honduras: intercropping of green manure
The systems of intercropped green manure in Honduras have proven themselves capable of fitting into numerous traditional maize and sorghum based farming system. They have in most cases controlled most or all weed pests naturally, used no land that had an opportunity cost, occasioned no out of pocket expenses greater than a one-time purchase of a handful of seed, increased soil fertility significantly and increased organic matter content.
Bunch, The Potential of intercropped green manures in Third World villager agriculture, 1990

Senegal: Improving quality of soils
In Sahelian countries, the major constraints to food production are related to soils, most of which are sandy and low in organic matter. Where they are heavier and better in quality, they are subject to intensive use and so exposed to erosion by water and wind. Since 1987, the Rodale Institute Regenerative Agriculture Research Center has worked closely with farmers' associations and government researchers to improve the quality of soils in Senegal by using agroecological methods. The RARC works with about 2000 farmers in 59 groups to improve the soil quality, integrate stall-fed livestock into crop systems, add legumes and green manures, improve the use of manures and rock phosphate, incorporate water harvesting systems, and develop effective composting systems. The result has been a 75-195% improvement in millet yields – from 330 to 600-1000 kg/ha, and in groundnut yields from 340 to 600-900 kg/ha. Yields are also less variable year on year, with consequent improvements in household food security. As Amadou Diop has put it: *"crop yields are ultimately uncoupled from annual rainfall amounts. Droughts, while having a negative effect on yields, do not result in total crop failure".*
Diop 2000 in Pretty and Hine 2001

Colombia: Comité de Investigación Agrícola Local (CIAL)
In Colombia, the CIAL programme has worked with 4000 farmers in about 50 communities. The aim is to improve agroecosystem productivity and health, extend the capacity of poor communities to solve agricultural problems, and take advantage of new economic opportunities. The greatest benefits appear to be for the poorest households. A wide range of different technologies have been developed, including rearing of guinea pigs, reintroduction of wheat cultivation, live barriers, IPM in potatoes, organically-produced sugar patties, agroforestry, use of green manures, mulches, and the establishment of small food enterprises. There are many important challenges, not least in finding ways to ensure that communities are able to mature and develop, rather than fall away after initial successes.
Braun, 2000 in Pretty and Hine 2001

Cuba: national policy for sustainable agriculture

Up to 1990, Cuba's agricultural and food sector was heavily dependent on external support from the soviet bloc. It imported 100% of wheat, 90% of beans, 57% of all calories consumed, 94% of fertilizer, 82% of pesticides and 97% of animal feed. But in 1990, trade with the soviet bloc collapsed, leading to severe shortages in all imported goods. The government response was to declare an "Alternative Model" as the official policy – an agriculture that focuses on resource-conserving technologies that substitute local knowledge, skills and resources for the imported inputs.

Two important strands to sustainable agriculture in Cuba have emerged:

- Intensive organic gardens in urban areas of three types – self-provisioning gardens in schools and workplaces (*autoconsumos*), raised container-bed gardens (*organoponicos*), and intensive community gardens (*huertos intensivos*);
- Sustainable agriculture on both large and small farms in rural areas.

Both have made a significant contribution to total food production. In 1994, for example, *organoponicos*, *autoconsumos* and *huertos intensivos* were producing some 4200 tonnes of food per year. For the *organoponicos*, an estimated 26,000 people are involved in direct food production.

Rosset, 1997, 1998; Murphy, 1999 , in Pretty and Hine 2001

Certified organic production

India: The Maikaal organic cotton project

In the Maikaal organic cotton project in Madhya Pradesh, India more than 1000 households are participating in an organic cotton project that started 1992. Among the results can be noted that: Average yields for cotton are 20% higher on the organic farms than in the conventional farms in the area; The yields of wheat, soy and chilli grown in the rotation with cotton are equal or up to 20% higher than on conventional farms; Yields in sugar cane are up 30%; The production costs in the organic system is only 30-40% of the costs for conventional production, even labour costs have been reduced; The crops need one or two rounds of irrigation less than in conventional farms; Soils have become softer and crumbly and pests do not pose any major problems

Tadeus Caldas, Ecology & Farming March 2000

Mexico: ISMAM fair-trade coffee

ISMAM was formed by smallholder coffee growers to meet problems of low productivity, poor marketing conditions and extreme poverty of farm families. By adopting organic techniques and improving quality, the co-operative was able to overcome soil degradation and low yields and move into a privileged speciality market that rewarded their extra efforts towards an ecologically sound production. Through sound, participatory management of the organisation and hard work, ISMAM was able to capitalise their enterprise, overcome initial government disinterest and repression to become a major agro-industry with their own processing facilities and direct export markets in the US, Europe and Japan.

They have begun to produce blends and soluble coffee for the national market and to diversify their agro-production for greater food security. Besides expanding their business, part of ISMAM's profits are returned to regional committees of the co-operative for investment in social works. In 1995 ISMAM received the National Agro-Export prize from the hands of Mexico's President. They now enjoy a privileged position with respect to credit and government support and have diversified their business into a number of areas including eco-tourism.

Ronald Nigh in Pretty and Hine 2001

Development of strategies for pests

Kenya: *Vutu-sukumu* (Push-pull) pest management in smallholder systems

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. One activity is investigating novel habitat management approaches to suppress cereal stem borer and *Striga* populations in maize and sorghum. This project is developing novel 'push-pull' strategies to repel stem borers from the cereal crop and attract them to intercrop or barrier forage grasses. It has found 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):
Pickett, 1999; Khan et al, 2000 in Pretty and Hine 2001

China: control of rice blast

In Yunnan, China farmers had serious problems with rice blast in the production of their traditional rice. Farmers almost doubled their rice yields when they interplanted their traditional rice with a blast resistant variety in blocks instead of growing just one variety. The yield increased because rice blast was unable to spread through the barriers of a resistant variety.
Nature 2000, vol. 406

Agriculture policy measures that promote organic agriculture and food security

With the increasing evidence and awareness of the advantages of organic farming, why has it not spread more rapidly and how can it be multiplied and adopted more widely? Major changes must be made in policies, institutions, research and development to make sure that organic agriculture alternatives are adopted, made broadly accessible, and multiplied so that their full benefit for sustainable food security can be realised. In addition, participatory, farmer-friendly methods of technology development must be incorporated. The challenge is to increase investment and research in organic agriculture and scale up projects that have already proven successful, thereby generating a meaningful impact on the income, food security, and environmental well-being of the world's population, especially the millions of poor farmers that in any case will not be able to access the industrial agricultural technology.

Required policy measures

Again, it must be emphasised that as the main reasons for food insecurity are to be found in the social and economic areas, most of the solutions will also be found there. Even if all the policy measures below were implemented food security will not be guaranteed in a society that is based on inequity and discrimination or where international trade rules work directly or indirectly against efforts to develop the local food sector.
In the following, food and agricultural policy measures that are directly related to farm production are listed.

General

- Identify and recognise already existing organic production systems
- Define a clear policy for sustainable agricultural development; Incorporate organic agriculture as a central part of overall policy
- Support to farmers converting to organic agriculture, or for the introduction of certain technologies

Economic measures

- Reform national economic indicators for the agricultural sector to reflect depletion and degradation of natural resources
- Implement the 'Polluter Pays' principle: Internalise "external" costs for environmental and health damage in the price of products
- Eliminate subsidies that encourage natural resource degradation or depletion

Food and markets

- Eliminate agricultural support programs that create commodity surpluses and lower global commodity prices
- Abolish distorting incentives, such as governmental pesticide or synthetic fertiliser promotion programs or special incentives for exports
- Prioritise safe food crops and investment in the food sector
- Develop local and regional food markets
- Promote sustainable consumption patterns and local food
- Promote value addition

Research, extension service, farming education and information exchange

- Prioritise research into organic agriculture, livestock and food crops
- Link research, extension and farmers closely
- Reform extension service and agriculture education and re-train staff both in knowledge and methodology
- Support farm based research, Farmer-to-Farmer exchange and other participatory methods

Empowering people

- Include a clear commitment to government-NGO partnerships and to the democratic process and a clear commitment to and inclusion of women, small farmers, indigenous people and other possibly disadvantaged groups
- Support producers' organisations, women's and community organisations to play a leading role in development

Access to resources

- Secure farmers' land tenure
- Make credits accessible for organic projects and production
- Reject privatisation of genetic resources and keep seeds in the public domain
- Protect Farmers' Rights to develop seeds and save seeds

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