



Seminar documentation:

Agriculture for development in a changing climate

November 5, 2009, Radisson SAS Royal Viking Hotel, Vasagatan 1, Stockholm

The seminar was a co-arrangement between the Swedish Society for Nature Conservation,
FAO Norden and the Organization for global food security
(Föreningen för global livsmedelsförsörjning).

This is a summary of the presentations and discussions at the seminar.
Some figures from the speakers are also included.
Compiled by Louise Hård af Segerstad, Albaeco

Photo: Jakob Lundberg, Anneli Nordling, Achim Pohl, Solomon H. Mariam, Centro Ecológico



Linking agriculture, climate and trade: global challenges and policy responses

*Mikael Karlsson, PhD, President Swedish Society
for Nature Conservation*

Mikael Karlsson started off, painting a broad picture, linking agriculture, climate and trade issues. He said that it is crucial to see the problems in the eye. The one billion suffering from hunger today is the worst human tragedy in history. Most of these are women and children in rural areas. This is a fact in spite of the enormous increase of the agricultural production. This is a fact in spite of that there is plenty of food and water for everybody. We must never forget this.

Food security and climate change are very much linked. The International Food Policy Research Institute (IFPRI) has published a report on climate change impacts on agriculture and the costs of adaptation. It shows that climate change will cause yield declines for the most important crops. Prices will increase, calorie

availability will go down and child malnutrition will increase. In a world where already one billion is suffering from malnutrition, our improvements will be eaten up by the impacts of climate change.

Agricultural production relies on water, which is a scarce resource. A fast warming will make the problem of water scarcity even worse. We must also relate the issues of agriculture to the problems associated with overfishing. We faced a peak globally in fishing already ten years ago.

What determines food security? Some say all we need to do is increase food productivity through technology. But this is an extremely narrow perspective, as food security depends on many factors (See Figure 1).

Some factors at the local community level are closely linked to global or national factors or policies. GMOs are by some presented as a silver bullet. But with this figure as a background Mikael claimed that other strategies are far more important, at least today.

A lot can be done at the local level: strategies for small farmers, ecosystem-based agriculture; and micro-credits for example. Sustainable technologies include agroforestry, and water harvesting. Participatory certification (PGS) and local markets for ecoproducts are also ways forward. A lot can be learnt by trans-disciplinary and participatory research on sustainable farming and production systems, management of ecosystem services, etc.

We need to support climate adaptation and mitigation in agriculture and there are some important fundamentals of the climate change policies. We also need to look at cost efficiency in the long term. The carbon off-set mechanisms must be designed so they are approved by the local communities. The best things to do for the climate are cheap; hence we can gain in our budgets now. What is called burden sharing should be called opportunity sharing. Empathy is the only resource that is scarce today if we want to leapfrog into a better planet.

Trade can promote or prevent sustainable development. There is a need for a change in hierarchy: environmental treaties must not be blocked by trade treaties. In agriculture, environmental costs must be internalised and production of public (environmental) goods be subsidized. Export subsidies should be phased out. EU must allow developing countries to use special protective mechanisms, e.g. Special Safeguard Mechanisms, and must decrease escalating tolls.

The SSNC has recently published the report “Global Europe and sustainable development” that aims to analyze the European Union’s current trade policy strategy, ‘Global Europe’. The study explores to what degree the strategy will or will not contribute to the needs of developing countries to adapt to climate change and develop sustainable agriculture. One important issue is policy coherence, which must be discussed even within Sweden.

Summing up, Mikael Karlsson concluded that there are many linkages between agriculture, climate and trade, and therefore it is important to keep a holistic approach in these discussions.

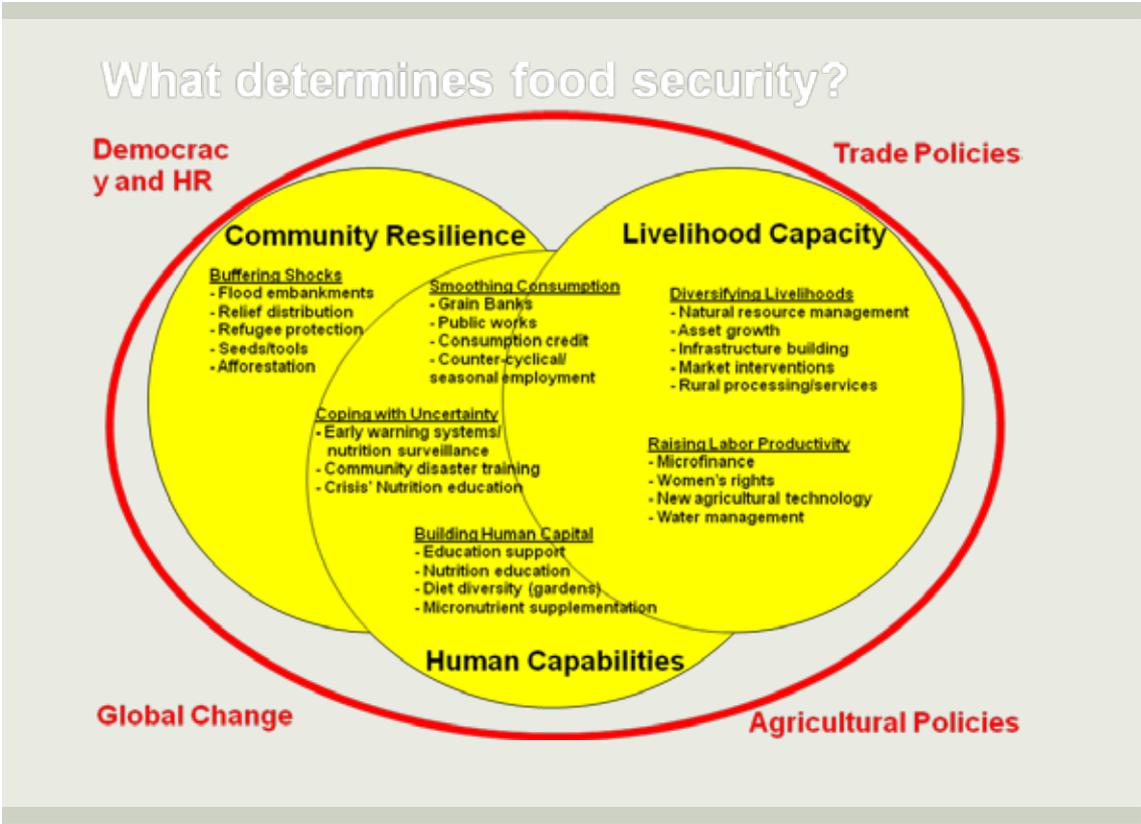


Figure 1. A framework of interacting policies, factors and capacities that all build or erode food security.



Food Security and agriculture for development

Anita Ingevall, Senior Adviser, Sustainable Agriculture, SIDA

Anita Ingevall began with stating the importance of agriculture for poverty reduction, as half of the world's population is living of agriculture, and that poor people are to a very large extent living on agriculture.

The Millennium Development Goal number One is to reduce hunger and poverty by 50 % before 2015. Today there is more than 1 billion hungry. We saw a decrease up till the beginning of year 2000, but now we see a rapid increase again. This increase is partly due to the food price crisis during 2007-2008, when prices doubled in a short period. One factor behind the raise in food prices was an increased demand for feed to cattle and for bio-fuels. This led to a decrease in Anita Ingevall began with stating the importance of agriculture for poverty reduction, as half of the world's population is living of agriculture, and that poor people are to a very large extent living on agriculture.

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Apart from this we have the slower environmental and climate crises. The effects of climate change are not yet seen in the global statistics of grain production, but effects are experienced locally.

In total numbers, the hunger situation is worst in Asia,



in spite of the economic development. This economic development is unevenly distributed; the poor in rural areas are not benefitting from it. Africa is the most worrying continent, where one third of the population is hungry and malnourished. This means reduced workability, and inhibited development in children leading to long-term effects, and leaving them more susceptible to diseases. As the dependency of food imports is high in Africa, the food price crisis struck hard.

The African countries are aware of the vulnerable situation and in 2003 the African Union took the Maputo Declaration stating that 10 % of public expenditure should go to agricultural development and there should be a 6 % annual growth in agriculture. Today, the national budgets have shares of 3-4 % going to agriculture, with an exception for a few countries. The development aid to agriculture is about 5 %, including Sida.

There is however a growing international awareness of the importance of food security. For example, FAO wants a mandate to have a council on food security and the G8 countries have made commitments to

radically increase agricultural aid. Large private initiatives are also steering money to the agricultural sector; and the climate change negotiations are at last recognizing that agriculture is an issue; which might lead to new funds.

How should the complex problems of food security be tackled? Still, most agricultural funds support more or less conventional farming systems. But this is hardly relevant in today's changing context. We need an agricultural system that supports the environment instead of deteriorating it. Any agricultural development must build on the local context and on local participation. It is not enough to look at new techniques or new seeds; as food security is a multi-sectorial issue. Health, education, infrastructure, access to markets are all factors to include. Who decides upon those issues? Who will balance the many interests? The issue of agriculture development must handle climate change, energy access and prices; as well as an increasing competition over land, so called land-grabbing. There are many reasons to evaluate and to start to think differently on agriculture for development.





Planetary Boundaries: Exploring the safe operating space for humanity from an agriculture perspective – The need for new approaches

Johan Rockström, Professor, Director, Stockholm Resilience Centre

In his presentation Johan Rockström specified what we should expect from agriculture the coming two generations. Humanity is hitting hard-wired processes at the planetary scale and we need to build our agriculture within the ecological space of the planet. The situation is more dire than we thought, because it is about more than climate. There is a quadruple squeeze:

1) The population and poverty dilemma, or the 20/80 dilemma, where 20 % of the world's population suffer from "affluenza", and 80 % are suffering from "pov-ertitis".

2) The climate squeeze. Latest science says that we should stabilize the level of carbon dioxide in the atmosphere at 350 ppm while 450 ppm is a policy interpretation of the findings; of the Intergovernmental Panel on Climate Change (IPCC), it is not a scientific statement. According to IPCC, 450 ppm means a 50 % risk of exceeding the target of maximum 2 degrees

warming. There is an uncertainty range of 2-8 degrees to how sensitive the planet is to the anthropogenic warming.

3) Deteriorating ecosystems. We could wish that the climate change would happen when we have a resilient planet, but the UN Millennium Ecosystem Assessment in 2005 showed that we erode the functions and resilience of the planet's ecosystems. Agriculture is the prime driver behind decreasing ecosystem services and functions.

4) The surprise pattern in ecosystems that insights from complex dynamics research show. Ecosystems seem to have multiple stable states. They buffer perturbations during long periods, having a seemingly good health. But accumulated change in a slow variable means that a small trigger can push the system over a threshold and lock it in a new state, less desirable for people, which can be very hard to reverse.

We need to focus on food security and agricultural development, both as poverty alleviator and in the work of climate adaptation and mitigation. If we are serious in halving hunger we need a new green revolution and it has to be a “triple” green revolution: it must produce 2-3 times more; in a sustainable way (compared to the last green revolution based on pesticides and fossil fuels); and it must include “green water management” (see box page 9), focusing on the small scale, community-based, participatory action research in rain-fed agriculture.

Our problem today is that our only recipe to create wealth is through high energy use. This solution to feed the world is not sustainable. We need a new sustainable pathway because the risks for ecosystems from this high energy use and the resulting climate change is very dangerous. The most serious is the risks of large scale discontinuity.

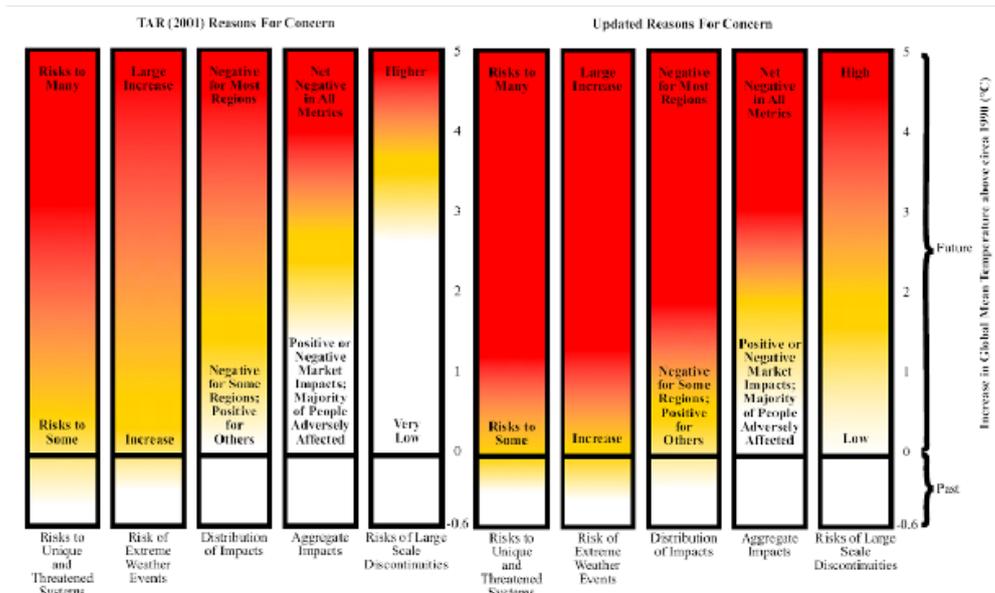


Figure 2. Climate change consequences plotted against increases in degrees Celsius global mean temperature after 1990. Each column corresponds to a specific reason for concern. Source: Smith et al. 2009

Considering the sensitivity of the global ecosystem we might already be in a very risky situation and should be talking about how to suck out carbon from the atmosphere.

To handle the climate issue, agriculture is central as a third of our greenhouse gas emissions come from agriculture. Today agriculture is a net source while the biosphere is a net sink. Hence, the planet is buffering the effects of our emissions, but this capacity might be going down. We see ecosystems like coral reefs, savannas and lakes tipping from a desired state into another

less desired state. Are there any risk of such tipping at a global scale, and can we identify the large processes that would be driving such a shift? This was a question me and a group of some 20 other scientists tried to answer in an article in Nature September 2009. The context is that the temperature variations on the planet have been quite dramatic under the last 100 000 years, and during that time humans on the planet lived as hunters and gatherers. But, 10 000 years ago, suddenly we entered a very stable phase – and during this now desired state human societies grew and the large civilizations flourished (see Fig 3).



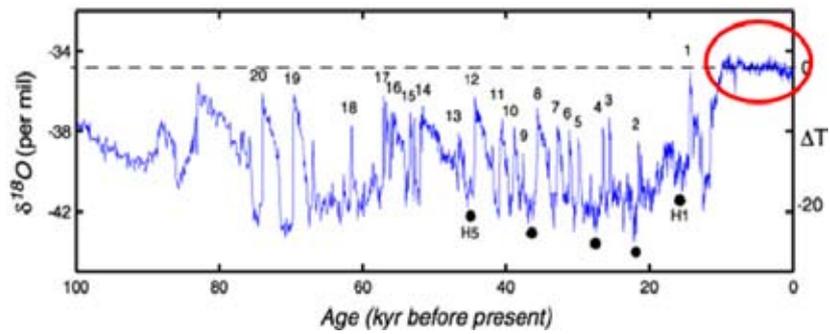


Figure 3. The last glacial cycle of $\delta^{18}\text{O}$ (an indicator of temperature) in the last 100 000 years. The Holocene is the last 10 000 years with a very stable temperature. Adapted from Young and Steffen (2009).

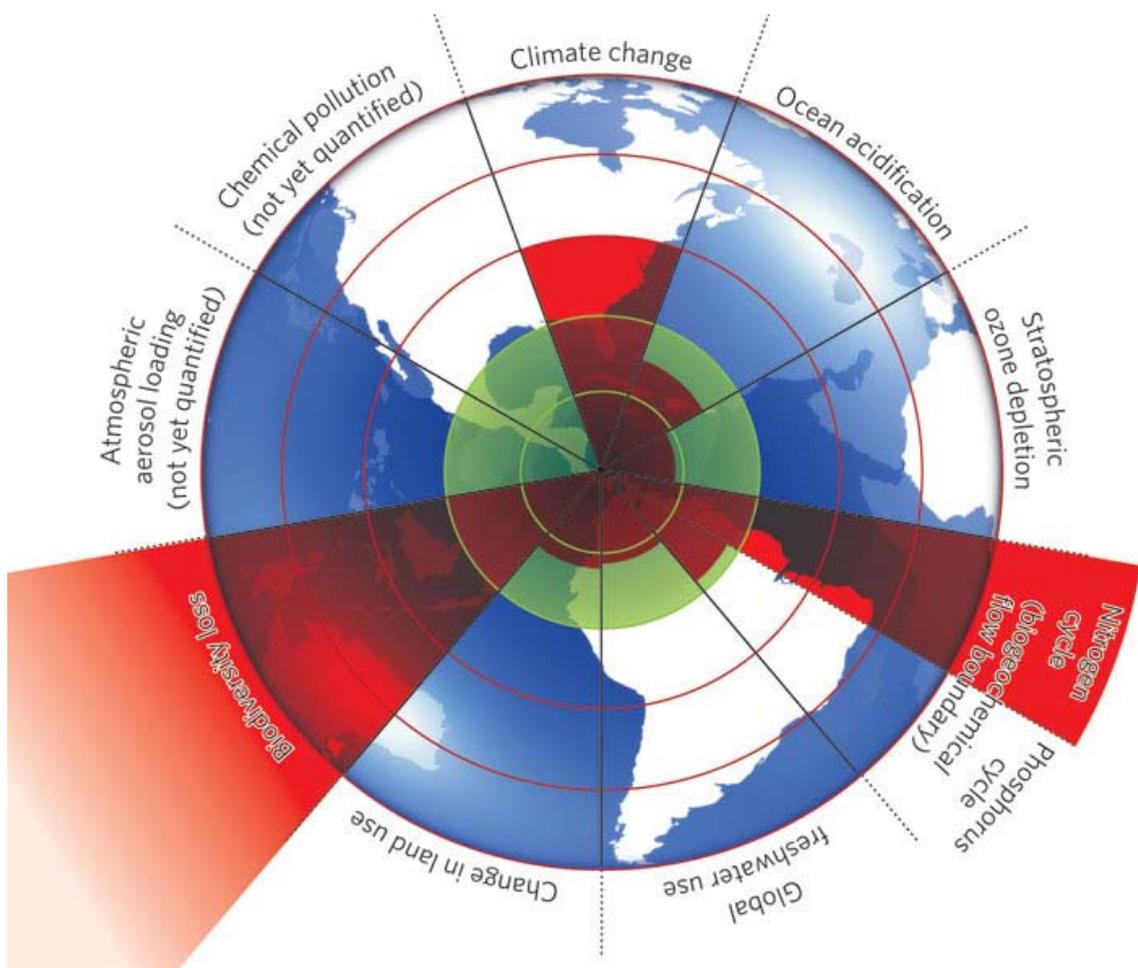


Figure 4. Planetary boundaries: The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. Source: Rockström and others. 2009. *Nature* 461, 472-475(24 September 2009).



“Blue water” is the liquid water in rivers, lakes and ground water. It is linked to irrigation-based agriculture.

“Green water” is the water that feeds the system as rain and forms soil moisture that is absorbed by plants (and then exhaled as vapour flow). In Africa, 95% of the agriculture is rain-fed in this way by ‘green water’.

In the article we take a normative stance and say that there is a stable state where humanity would like the planet to stay. Our research group found nine processes that can induce unacceptable change. We also propose nine planetary boundaries that can form a basis to put criteria on the agriculture for the future (see Fig 4). It is not only about climate, we impact the nitrogen and phosphorus cycles to a point where it has feedbacks on the climate system and deteriorates ecosystems. The rate of biodiversity loss has reached a level that can be seen as the sixth great extinction and it is not only about species loss itself, it also leads to a less well-equipped “toolbox” to build resilience in the ecosystems. Regarding land-use change; the conversion of land must be limited and we propose that no more than 15% of the global ice-free land surface should be converted to cropland. Freshwater use, ocean acidification, aerosol loading, stratospheric ozone and chemical pollution are the other processes and boundaries suggested.

These results have major implications for the future of agriculture. Improved land management practices in agriculture have the potential to sequester 0.4 – 1.2 Gigatons of carbon per year according to Rattan Lal, Professor of soil physics in at Ohio State University. 1,2 Gigatons corresponds to one ninth of the reduction challenge. To achieve this in a robust way with increased productivity we suggest something that has never been tried:

1. zero-till system where the carbon is kept in the soil while improving water holding capacity;

2. sustainable (ecological) sanitation (urine and faeces are separated at source) and thereby getting use of the nitrogen;

3. water harvesting systems (gathering, or accumulating and storing, of rainwater).

In summary, the global specification for world agriculture within the safe operating space of Earth need:

1. To stay within 350 ppm CO₂ in the atmosphere – an agricultural system that goes from being a source to a global sink

2. A green revolution on current cropland, small expansion from 12 % to 15 %.

3. Keep global consumptive use of “blue water” (see box below) under 4000 km³/yr. Today we are at 2,600 km³/yr and rushing fast towards 4000 km³/yr.

4. Reduce to 25 % of current nitrogen extraction from atmosphere.

5. No increase of phosphorus inflow to oceans.

6. Reduce loss of biodiversity to less than 10 species per million species/year.



The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD): Selected key findings

*Janice Jiggins, Prof. Wageningen Univ.
and Visiting Fellow Inter. Inst. for Environment and Development (IIED), London.*

Janice Jiggins described The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) as being an intergovernmental process, much like the IPCC. IAASTD considered agriculture's potential to reduce hunger and poverty; equitably improve rural livelihoods, human health and nutrition; and promote socially, environmentally and economically sustainable development.

IAASTD aimed at answering what challenges that can be addressed through agricultural knowledge, science and technology, as well as which are the likely positive and negative consequences. Also what are the enabling conditions required to optimize the uptake and diffusion of agricultural knowledge, science and technology, and finally what investments are needed to help realize this potential.

Janice Jiggins continued with some of the key findings from this huge endeavor:

- Food security, sustainable agriculture, poverty reduction & healthy diets are not possible under the way we do things today, i.e. 'business-as-usual' scenarios.
- Environmental, social and output objectives need to be integrated throughout production-to-consumption chains.
- This requires multi-functional agriculture and significant institutional transitions.
- It also requires a change in accounting, so the full cost is revealed. Today decisions are made on inadequate information as prices are not reflecting all costs.

Small scale producers are essential part of the solution:

- They produce the bulk of the world's food
- They command the larger part of under-utilised land, water and biodiversity
- The majority of the world's poor and hungry derive livelihood from these resources
- They are structurally excluded from unequal and unfair trade and market opportunities
- The greatest potential for raising productivity lies in this sector

What are the options to consider that were offered by the IAASTD process?

- To emphasise agro-forestry, 'ecological' agriculture, and other water, energy, and biodiversity conserving technologies and practices. This applies globally.
- Institutional developments that place science as a driver toward multi-functionality and resilience.
- More open access to markets, and trade that reward sustainable practices; including a change of the Intellectual Property Rights regimes.
- De-coupling of fossil fuel and food prices; and demand for food and non-food products, agriculture has an absolute dependence on the fossil fuels.

However, this is not happening, because we got markets and business hopelessly entangled in a pathological way. Ideally markets should supply three things: 1) produce efficient allocation, 2) lead to a diffusion of economic and political power and 3) stimulate innovation. But in agriculture we have the opposite situation.

1. We have prices that do not reflect the costs, leading to a non-efficient allocation.
2. We have allowed a degree of concentration in the agricultural sector that is not allowed in any other sector. The share of the markets by 4 companies in agrochemicals is 60% and for seeds it is 33 %, numbers increasing every year.
3. This concentration steers innovation along a pathway that rewards the corporate enterprisers, and this is not necessarily the products or practices that are best for sustaining people or food security in a long-term perspective. The sustainable management practices are not being spread.

The IAASTD findings are being challenged. Every author has taken this to their respective governments, EU-commission and other arenas, where they meet denial, and an unwillingness to deal with uncertainties. The audience who is most open is the foreign af-

fair ministries, because they can foresee the geopolitical turmoil that will engulf us if we do not deal with this. Since the release we see:

- A rapid appropriation of land and water resources.
- Elements in the corporate sectors saying "we do not have enough farmland, and populations are growing too fast, and the solution is advanced technological solutions; continuous push of the land frontier; and population control in poor populous countries". They leave out all the results from the IAASTD.
- There are plans for a third farming revolution in terms of releasing farming from the land, a process that can be done in urban areas. This type of production is not the solution as it does not improve the long-term efficiency of agriculture.
- Climate change shakes the dice. The areas of production will change with climate, and the crops will change, everybody will be affected. But we don't know what will change and not how.

However, there are positive steps taken by civil society programs that do not wait for governments to act:

- Fair trade move from being a niche alternative into mature economies, building fair trade chains between producers and consumers in the OECD environment.
- Working with public procurement. The money already available in public sectors should be used to drive another kind of food and agricultural system. One example is the Cornwall food program which started in hospitals having problems with huge amounts of waste. They started to source the food locally, primarily organic, creating new menus resulting in a 90% cut in food waste, and patient satisfaction continuously rising. The growing, local organic production has opened for increased tourism; a widening circle of positive feedbacks without any new money, just with an ethical purpose.
- Already 5-10 years ago NGOs started to work with local climate data from farmers. These data show a breakdown in the synchronicity between the interconnections in the agricultural system. Pollination, water availability etc changes as the temperature rises. There are delicate interconnections that are breaking down.

There are also positive government responses to today's challenges:

- In Mali "the law for the orientation of agriculture" which mandates priority to family farming, local markets, and food (rather than non food);

and integration of natural resource management. This is a huge institutional change done in one of the poorest countries in the world.

- In 2008 China passed “the circular economy law” with principles of reduce, renew and recycle. It covers every sector. It emphasizes organic farming and “eco-friendly” forestry for example
- There are technical discussion of changes to Intellectual Property Rights and DUS/VUC (regulation around seed distribution) but this does not matter at all when facing climate change. With the high instability we face we need to have biodiversity at every local level to enhance our ability to tackle the changes.
- There is a lot more investment from governments in foresight studies. Work is being done to put those results into political packages, to advance the political debate.
- Some governments are opening up to new forms of democratic engagement. What choices are we doing for the future? This question cannot be dealt with by experts alone.
- ‘Integrated food policies’. For the first time ever, this year the senior individuals in EU from agriculture, health, environment, trade and food, sat down together in the same room. One of the suggestions to respond to the financial crisis as well as the need to reform the CAP was an ‘integrated food policy’. This will state the essential needs: healthy affordable diets that are grown in ways that respect the environment.
- The IAASTD summary came into the hands of French president Sarkozy, who through the EU commissioned a report by Joseph Stiglitz, Amartya Sen, and Jean-Paul Fitoussi on how to develop measurement and accounting for social and environmental costs; Commission on the Measurement of Economic Performance and Social Progress. They had 12 recommendations and EU has approved it, which means that Europeans will get the chance to drive the change.

Morning panel discussion:

The focus of the discussion: how can we move forward? One overarching conclusion was the need for change in mentalities, a change in attitudes. All want to live well and prosperous and keep the planet to provide us with what we need. This requires an understanding of the conditions under which we live. We have locked ourselves in a governmental system that is separated from nature and we let it govern us in more and more areas.

Then the discussion moved to more concrete areas needing change, which the panelists agreed ranges

from local practices to global structures. We need to reinvent society. We must learn as well as look for new approaches and patterns. Sectors and individuals that understand the new paradigm have to move forward without waiting for slower actors. And there are institutions in place that can be used, as taxes.

The role of corporations were discussed, and *Janice Jiggins* pointed to the lack of control as a problem, while *Mikael Karlsson* thought we should be a bit more optimistic, believing that corporations will do what the rest of society does.

Anita Ingevall pointed out that more development aid should go to agriculture, as it relates to so many issues: health food water etc. Work on democracy and human rights also demands food. Those individuals that want to change Sida’s policies need to influence the government, where there is a very limited view of the role and possibilities of agriculture.

Discussing the nitrogen cycle the panelists came back to the need for a holistic view, as the problems of nutrient over-load in part is a result of limited scope in planning and accounting. Large improvements can be achieved with the help of remote sensing, which gives a farmer the capacity to read the landscape see the potential yield of any given crop. This goes even for small holder farmers.

The need for another mentality does not only refer to the relation between society and nature. When it comes to the “wicked” problems we face where we have scientific uncertainty, we also need to focus on the relationships in society: the norms and rules, who carries the burden? public participation etc. How shall we interpret uncertainty and how should we handle risks? These are issues that also need a broad public debate.





Agriculture and ecosystem services – tradeoff or synergies?

Andre Luiz R. Gonçalves, PhD, Centro Ecológico, Brazil

Andre Gonçalves introduced Centro Ecológico which is an organization working in the southern Brazil since 1985, and he thanked for the support from SSNC. In his presentation Andre showed that it is possible to have a synergistic relationship between ecosystem services and agricultural production.

Brazil is the world's 7th largest emitter of green house gases, and 70 % of the emissions come from land use change. There is a common chain of events leading to this, starting with the illegal timber logging, followed by burning of the soil to put cattle to graze, and finally the land is transformed to soy bean production.

This removal of the Amazon forest is not only about removing the vegetation; it is also about exporting nutrients and about biodiversity loss. Regardless of the high deforestation rate at 20 000 square km/year, the

Brazilian government say Brazil can produce food for the country and ethanol for the world.

Andre Gonçalves then continued to give two examples of combining agriculture and ecosystem services. In the southernmost state of Brazil, there is Atlantic forest. Land use is mostly banana production in small scale where the farmers clear the land to establish banana production in monocultural systems, depending on pesticides, and leading to erosion. By promoting so-called agroforestry systems instead of the monocultures for small holder farmers a more secure, resilient food system is created. In such an agroforestry system there is a mix of trees and plants from the Atlantic forest with the bananas leading to a recovery both in terms of plants and animals. In a study it was shown that this system gives positive synergies as it: promotes biodiversity (found 42 species of trees); improves livelihoods (higher and more secure income)



and delivers an ecosystem service of carbon sequestration; compared to conventional farmers.

There were some very interesting results when the area was struck by a hurricane 4 years ago, (in an area normally not struck by hurricanes). Most of the banana monocultures were completely destroyed by the hurricane, while the agroforestry systems were more resistant. Hence, agroforestry systems are not only working as mitigation (taking up and storing carbon), it also showed to be a way to adapt to a changing climate.

The other example comes from another area – in Mato Grosso. This is a frontier of agricultural expansion in the Amazon, where the government is now trying to promote agroforestry systems. It is an area important for conservation, but the backbone activity is cattle ranching and timber extraction. In this area we compared agroforestry with pasture and we found that the agroforestry systems give more energy and more

protein per hectare compared to a pasture, Andre Gonçalves told the audience. An agroforestry system can feed more people per hectare, in one example 9 persons per hectare compared to 0.5 person/ha for a conventional farming system.

Concluding Andre told us that the agroforestry system had considerably higher food production than the non-agroforestry systems and they have higher energy efficiency – leading to higher sustainability and food security. Carbon stocks in agroforestry can reach values similar to pioneer-secondary forests and the economic results are competitive if contrasted with any other current land use.





Sustainable/ecological/organic agriculture in Ethiopia for food security and adaptation to climate change

Sue Edwards, Director, Institute for Sustainable Development, Ethiopia

Sue Edwards started with citing the Ethiopian environmental policy from 1997: “Ensure that essential ecological processes and life support systems are sustained, biological diversity is preserved and renewable natural resources are used in such a way that their regenerative and productive capabilities are maintained, and, where possible, enhanced...; where this capacity is already impaired to seek through appropriate interventions a restoration of that capability.”

Ethiopia is the water tower in this part of Africa, 80% of the river Nile comes from Ethiopia, but it is most known for its very dire dry conditions. This year 6 million people are short of food. In the region of Tigray in northern Ethiopia where we work there is hardly any suitable land for agriculture, it is highly degraded, Sue

explained. Also many greener parts are threatened by degradation. Every year there are flash floods killing people and removing soil and housing.

But Sue Edwards also pointed out the big opportunities in Ethiopia:

- High population and high rainfall, sometimes considered to be problems, but not if it is well managed.
- Farmers knowledge and skills are high, Ethiopia have had farming for 5000 years.
- There is a high diversity in the crops, both in the number of species, and in the genetic variation within crops.



- Very low use of external inputs, and no debts.
- Government is committed to decentralization, putting the local development in the hands of local communities.
- Soils able to retain more moisture and resist erosion, in dry years this means there is still a harvest.
- Aquifers recharged – springs reappeared.
- Double cropping, i.e. 2 crops per year with access to harvested water.
- Farmers diversify production and introduce perennial crops.
- Families better fed and clothed and children able to attend school.

In our project the base is an agriculture system that is in tune with the ecosystem; building on the local knowledge and natural human innovation. The Tigray project started in 1996 and the key components were:

- By-laws - communities restore local control to manage their natural resources.
- Biological and physical water and soil conservation, particularly planting the multipurpose small tree *Sesbania sesban*.
- Stopping free-range grazing, controlling access to vulnerable land (watersheds), so grass, herbs and trees can grow (the livestock walk is important).
- Restoring soil fertility through making and using compost, and helping farmers avoid debt paid for chemical fertilizer.

The Ethiopian government has responded to our work and from now on the making and using of compost will be incorporated as part of the standard extension package (directive from the Prime Minister's office); also Ethiopia is taking the lead for Africa in the Climate Change negotiations, and climate change negotiations should be the start of support for "the Tigray Project" to be adapted to / adopted in Sub-Saharan Africa.

In studies comparing the addition of compost with chemical fertilizer, the compost gave not only higher yields than the chemical fertilizer, but also a better grain index (the grain's proportion of the whole plant). Another advantage of the compost is that it has a long term effect, for more than one year, while the chemical fertilizer needs to be applied each year.

Other positive effects of the Tigray project include improvements to lifestyles and improved ecosystem services:

- Reduction in difficult weeds, including *Parthenium* and Ethiopian wild oats.
- Avoidance of debt and delays in getting chemical fertilizer.



A few of the huge range of sorghums grown in Ethiopia.



Food Security and Farmer Empowerment in the Philippines

Chito Medina, MASIPAG, the Philippines

Chito Medina started by stating that when discussing agriculture many people talk about seeds or agricultural technologies while forgetting the farmers themselves.

Masipag is an acronym meaning “Farmers-scientists partnership for development”, it started in 1986 as an alternative to the green revolution as farmers found they were getting less income, and had contamination from the green revolution’s chemical use.

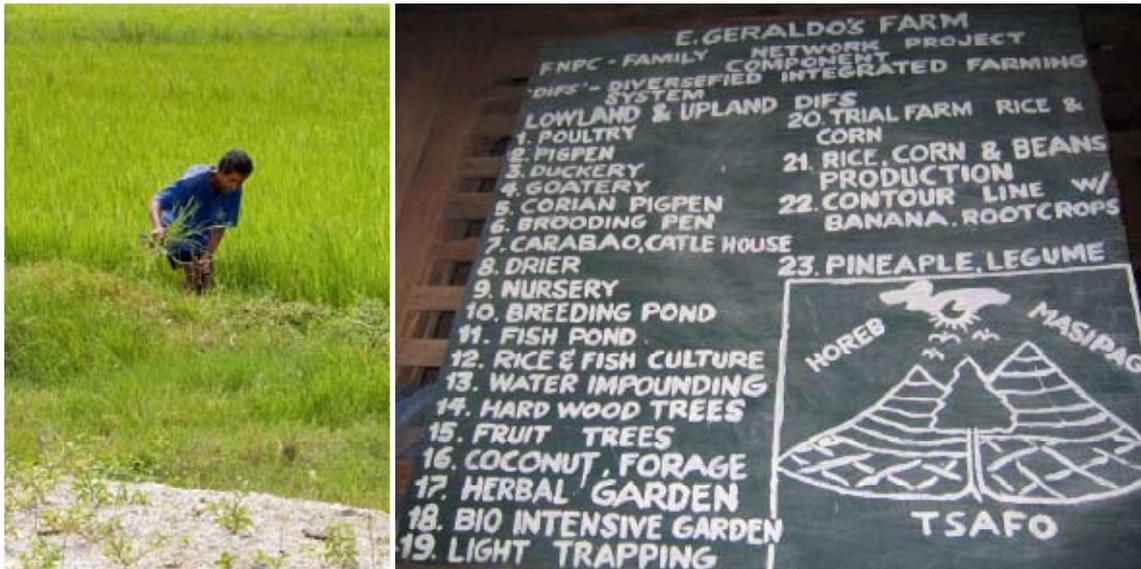
The goal of Masipag is to empower resource-poor farmers and improve their quality of life through:

- Participatory planning and development
- Effective and efficient utilization of locally available resources
- Access and control of production resources

Why involve local farmers?

- Local varieties of rice are disappearing because they are displaced by modern seeds.
- Modern seeds are expensive and needs a lot of inputs (e.g. fertilizers and pesticides).
- Modern seeds do not address the needs or priorities of small farmers.
- Patenting shifts control of seeds to few big corporations.

Masipag works as an organization and a network. In total more than 35 000 farmers are in the network through a number of local peoples organizations. Since 1986 Masipag has worked with rice breeding among farmers; a work that was previously thought only could be done by researchers in the laboratory.



Today Masipag also works with chicken breeds. The goal is that each farmers group can breed and find varieties that are suitable for their local context.

In the world there are 130 000 rice varieties. Masipag have collected one fourth of our original rice varieties and we have developed 1069 breeds in our project, Chito Medina explained. Each farmers group gets a number of rice varieties. The farmers improve the seed by breeding and the breeders give their names to the varieties, underscoring the interdependence between the farmer and the seed. We have several layers of seed banks: On farm, 2 regional backup farms, and a national back up farm with 2000 rice varieties. Then we have some 200 farmers that all hold about 50 varieties each also working as a seed bank. This addresses the question of accessibility. When we give seeds we give 50 varieties to an organization so they can plant many varieties and see which are best suited in each place. Recently all seeds were lost in an area during a flooding incident. But they could get help from other groups as there is an easy flow of seeds without cost to the farmer that has been hit. This is working as a social insurance, a coping mechanism against disturbances.

Regarding the productivity we have not found any significant difference between organic and conventional systems, but looking at income, there is a significantly higher income from the organic production. Unfortunately the government is still supporting the chemical use.

We work for the notion of multifunctionality: diversified and integrated farming systems, for example ducks are natural pest control and poultry is the “bank in the backyard”. The poultry can take care of

itself during a storm and when you need money you can sell the hen. When school should be paid or someone get sick you sell the pig.

To promote food security there are a few guidelines:

- Use biodiversity.
- Technologies should not create farmers lock-in, instead strive for participatory solutions.
- Enhance the ability of farmers for self determination, manageability of the farm. Not a package of technology, rather control of their own technology and resources.
- Combine scientific and technological innovations with democratic processes that encourage active and meaningful participation of the farmer or stakeholder. The technology should fit into the context of the farmer.

Finally, Chito Medina summarized his talk with the following bullet points:

- Small farmers can improve seeds to suit different conditions and objectives.
- Seeds and technologies developed by farmers are practical coping mechanisms to deal with climate change
- Biodiversity conservation and utilization can contribute to agricultural productivity and sustainability, and food security.
- Agricultural development should be more inclusive; policy people tend to think of one type of agriculture all over the world – this is wrong –

support to biodiversity-based ecological agriculture and farmer-centered approaches should be increased instead!

Afternoon panel discussion

The discussion started off with the question: why these sustainable small scale solutions are not more widely spread and how that can change? The panelists saw several reasons but the main one being the lack of scalability to make profits from these kinds of practices. The systems presented are not possible to make profits from in big corporations, for example an agroforestry system is an autonomous system that needs no external input. Very little resources are spent to spread these environmental technologies. Adding to this is that government programs in most countries still tend to promote industrial systems based on pesticides and fertilizers, and farmers are attracted to what the government supports. To change this there is a need to create a momentum to influence and attract others, and we need to do a lot more talking about the IAASTD and other successful experiences.

Andre Goncalves started off the next topic on whether organic farming can feed the world with a counter question: is conventional farming feeding the world? It is not a matter of production, rather we should talk about food systems, and, the current food system is not feeding the world so we need the change. Sue Edwards elaborated on who will feed us in a world of crisis, saying that we will be fed with products from our neighborhood. Chito Medina then pointed to the fact that many people talk about how to feed the world in 10 years, but we need to talk about today and tomorrow as there are one billion who are hungry now. The farming system he presented can at least feed and produce enough to the local farmers.

Then the panel discussed different types of compost and other ways to fertilize organic farming systems, saying that there are as many types of compost as there are farmers. Whatever biomass there is, it will rot, and can be used for compost. Using human waste takes a

bit more care to not allow for carryover by pathogens, but it can be solved with for example more urine. It is about returning the nutrients to the soil. We have to look for systems with closed nutrient cycles. We have to understand that soil is a very complex and living organism, that is the base of production.

The successful projects run by the three panelists' organizations are not only producing food for the farmers themselves but also a surplus. This has led to the establishment of markets. They are making the distance shorter between producer and final consumer. In Brazil the schools are required to buy 30 % of the food from local producers, which lead to good local effects. Chito Medina also explained how the surplus is increasing, but the focus is to keep the distribution local. First we need to have food for the farmer's own household, second to local sales, and lastly to other markets. Also poor people should have right to safe food. By cutting out the middle layers in sales chain both the farmer and the consumer can be winners.

Summing up, the panel gave some reflections on what is needed in terms of policies at the national level, and where international funding for small holder farmers should be directed. Andre Gonçalves said that the Brazilian policies still are focused on export commodities to bring in income to the country, and comparatively very little money go to small holders. There is a need for a whole set of new policies for education, infrastructure, better prices, proper markets. Sue Edwards continued by saying that there was no problem with policies in Ethiopia, but problems with the implementation. She wanted the investments to primarily go to education; participatory plant breeding is one good thing. The agricultural education today is highly distorted and the small holder farmers will not get the support needed without a change in the education. People who have gone through education have been taught that the American farmers are the best in the world. They cannot go back and talk to farmers. They have been dis-educated. You need to know the work on the ground.





The way forward – two parallel workshops:

Workshop 1: Svenskt jordbruk i ett förändrat klimat

Svante Axelsson inledde och beskrev syftet med workshopen vilket var att specificera ”det hållbara jordbruket” som vi har skapat i framtiden. Det handlar om att hitta system som löser de stora problemen som jordbruket hänger samman med nämligen kväve, biodiversitet, och klimat. Samtidigt har vi en växande konsumtionsökning, och dessutom en förväntan på att jorden ska leverera mer tjänster, såsom bio-bränsle. Christel Cederberg, Klimat expert vid Institutet för livsmedel och bioteknik (SIK) och lantbrukare, samt tre forskare från Sveriges lantbruksuniversitet (SLU): Maria Wivstad, Johan Ahnström och Johanna Björklund fick ge sin version och vision om det framtida hållbara jordbruket.

Christel Cederbergs vision för det framtida jordbruket, framförallt kring klimat och kött, kräver att vi pratar om hållbar konsumtion och inte bara produktion. Om ’business as usual’ fortsätter innebär det en fördub-

bling av köttproduktionen till 2020 vilket skulle ställa stora krav på mer foder. Den ökande efterfrågan på kött driver hårt, det måste bli dyrt att sälja billigt kött. Idag produceras 40 kilo kött per hektar regnskogsmark och detta är marginalköttet i världen, dvs där den ökande konsumtionen får sitt kött. Men vi kan också effektivisera produktionen och producera mer kött per mindre insatsvaror eller foder. När vi äter kött ska vi välja naturbeteskött och lite kyckling och svin.

Johanna Björklunds vision tog avstamp i just behovet av starka visioner för att hjälpa oss att ställa om till ett hållbart jordbruk. Vi måste koppla ihop människor som konsumerar med de som producerar, dels för att minska transporter men också för att sluta kretsloppen. I Sverige importerar vi två hundra tusen ton kväve som vi alltså måste föra ut igen, alternativt omvandlas det till kvävgas, och då blir det också lustgas – vilket är en kraftig



växthusgas. Vi måste använda kvävet mer effektivt, men också sluta kretsloppen mellan stad och land. Vi ska odla mer i städerna: färska grönsaker, ägg, kyckling. Det sluter kretsloppen, minskar transporterna och är viktigt för lärandet. Jordbrukslandskapet ska vara utformat som ett trädjordbruk, det är ett produktivt system, med träd, buskar örter, och perenna växter. Det binder kol, det är plöjningsfritt, det producerar mer, och ger även biologisk mångfald. Vi ska ha djur som bidrar till kolinbindning och som inte konkurrerar om vår mat. Grisar, kycklingar och andra ska äta matrester istället för foder som konkurrerar med vår föda. Då använder vi också kvävet mer effektivt, om det får cirkulera flera gånger. Djuren ska fördelas i landskapet så att gödseln kan utnyttjas och skatten på gödsel behövs. Fokus är kretslopp, lokala anpassningar och mångfunktionalitet.

Johan Ahnström beskrev hur lösningarna inte behöver inte finnas så långt bort, många lösningar finns lokalt. Nyckelord är stolthet hos lantbrukaren som producerar mat och levande landskap, och ödmjukhet hos forskare. I och med att vi har alla bekämpningsmedel så har vi tittat väldigt lite på hur naturen kan hjälpa oss. Pollinationsforskningen har kommit längst för där finns inga alternativ. I gammal litteratur kan man läsa om att utnyttja svampar mm mot skadedjur, dvs naturliga predatorer. Vad gäller den biologiska mångfalden, är hälften av våra hotade arter kopplade till odlingslandskapet. Men det är oftast inte de arterna som utför alla ekosystemtjänster, det är främst de vanliga arterna som gör det, men de minskar drastiskt i antal (en tredjedel av alla Europas bin dog förra året). Vi kan prata om nytan av naturen utan att definiera för vem. Naturen gör

ju massor av saker för oss, vi är ju helt sammankopplade med naturen vilket många missar idag. Lantbrukare vet förstås det, de är mycket klokare än vad de blir behandlade som.

I *Maria Wivstads* vision ska vi agera inom två kretslopp vad gäller kvävet. Både stad-landkretsloppet och de interna flödena inom lantbruket. Idag finns djurgårdarna i en del av landet och köper foder från en annan del av landet. Djurgårdarna får ett överskott av gödsel och beroendet av gödning uppstår i odlingsområdet. Men ingen vågar nämna något styrmedel, trots att detta innebär ett enormt slöseri med stallgödsel. Total mängd kväve i det vi producerar i Sverige är 100 000 ton kväve. I stallgödseln finns det 100 000 ton och i konstgödseln 150 000 ton. Det betyder att det kommer in mycket nytt kväve till landet, vilket vi måste minska. Avloppen och jordbruket delar lika på kvävebelastningen på Östersjön. Så en annan viktig åtgärd är att ha andra avloppslösningar, eftersom reningsverken släpper igenom 80 % av kvävet. Bättre att föra tillbaka urin till åkrarna. Med de få arbetstimmar vi lägger in i jordbruket är vi väldigt beroende av kemikalier. Det betyder inte att det är omöjligt att producera utan kemikalier.

Workshop 2: “Global perspectives – a group-based SWOT analysis of agriculture based on biological diversity and ecosystem services”

In this workshop participants were first divided into smaller groups in order to conduct a so-called SLOt-analysis (often called SWOT). It is a strategic method used to evaluate the Strengths, Limitations/Weaknesses, Opportunities and Threats involved in a project.

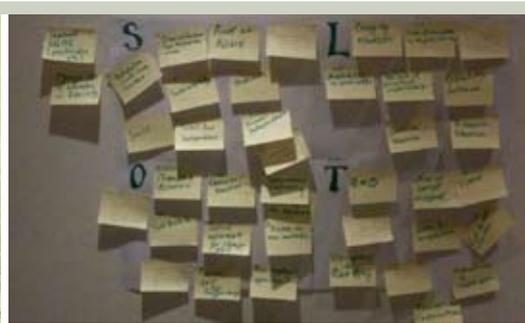
First, participants specify the objective of the project and identify the internal and external factors that are favourable and unfavourable to achieving that objective. In this case the desired end state, or objective, was presented to the groups by *Fredrik Moberg* who facilitated the workshop. The objective was as follows:

“Agriculture must change course in order to reach the international targets on eradicating poverty and decreasing hunger in a sustainable way. Future agriculture must be based more on biological diversity and ecosystem services than on chemical inputs and fossil fuel.”

The Strengths, Limitations, Opportunities and Threats involved in this endeavour were defined as:

1. Strengths: of the ecosystem services and diversity-based agricultural approach itself
2. Limitations: of the ecosystem services and diversity-based agricultural approach itself
3. Opportunities: external conditions that are helpful to achieving the objective
4. Threats: external conditions which could do damage to the objective

After discussing in the different groups for about 35 minutes, the groups chose 3 strengths, 3 limitations, 3 opportunities and 3 threats per group and wrote down these on sticky notes. These sticky notes were then used to present the results to the other groups. Below you see excerpts from the group presentations in a SLOt matrix (see also photo below for the actual matrix produced by the groups when putting up the sticky notes on the wall).



Strengths	Limitations
<ul style="list-style-type: none"> - Food locally available - Fossil fuel independence - Improved health (no pesticides etc) - Diversification of incomes - Changed role of women - Adaptation to climate change 	<ul style="list-style-type: none"> - Availability to good seeds - Labour intensive - Lack of practical experience - Difficult to change mindset - Too little research attention - Lack of education in organic farming
Opportunities	Threats
<ul style="list-style-type: none"> - Increased consumer awareness - Climate crisis - Peak oil - Builds self-sufficiency - Social movement for change by NGOs - Access to new markets 	<ul style="list-style-type: none"> - Costs of certification - GMO and patents - Transnational corporations - Misuse of the concept “organic” - Rules and regulation - Government-supported chemical inputs



Read more:

- The International Assessment of Agricultural Knowledge, Science and Technology for Development, IAASTD: www.agassessment.org
- Effects of industrial agriculture on global warming and the potential of small-scale agroecological techniques to reverse those effects: <http://viacampesina.net/downloads/DOC/ViaNWAEG-10-20-09.doc>
- Commission on the Measurement of Economic Performance and Social Progress www.stiglitz-sen-fitoussi.fr/en/index.htm
- Henrysson, J. and Höök, K. 2007. Food, Climate and Development. Report by Swedish Society for Nature Conservation: www.naturskyddsforeningen.se/upload/Foreningsdokument/Rapporter/rapport-klimat-food-climate-development.pdf
- Lundberg, J and Moberg, F. 2008. Ecological in Ethiopia – Farming with nature increases profitability and reduces vulnerability. Swedish Society for Nature Conservation. 28 p: www.naturskyddsforeningen.se/upload/Foreningsdokument/Rapporter/engelska/Report_international_Ethiopia.pdf
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- Rockström, J and 27 others. 2009. A safe operating space for humanity. *Nature* 461: 472-475.