WHAT CAN ORGANIC FARMING CONTRIBUTE?

Are organic farming systems more climate friendly and climate resilient than conventional ones? And does this make them suitable to maintain global food security in changing climate conditions? Our authors believe that this is the case. However, they say that in assessing mitigation and adaptation potential, one should not only look at production aspects, and make a case for a food systems perspective.

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Organic farming offers several ways to mitigate climate change when compared to conventional agriculture:

First, organic farming, through its key practices of organic fertiliser use and crop rotations with forage legumes, tends to increase soil organic carbon levels resulting in carbon sequestration. This contributes to climate change mitigation, as it absorbs CO_2 from the atmosphere and stores the additional carbon in the soil. However, depending on soil type and climatic conditions, this process usually comes to a halt after some decades, when soil organic carbon levels have reached a new equilibrium and soils are thus saturated with respect to organic carbon contents. Furthermore, this storage of organic carbon is reversible and the carbon can again be released into the atmosphere as carbon dioxide when switching to unsustainable practices.

Second, organic farming does not use mineral fertilisers. Thus, the emissions from industrial fertiliser production are avoided. In contrast to carbon sequestration, this is a permanent mitigation benefit that can be realised every year anew.

Third, organic farming generally has higher nitrogen use efficiencies and lower nitrogen use levels than conventional agriculture. This results in correspondingly lower emissions of the potent greenhouse gas nitrous oxide from fertilised soils, which is another straightforward and permanent mitigation benefit.

Fourth, organic farming tends to work with lower stocking densities of animals with respect to the land area available for grazing and feed production. These lower animal numbers go along with lower direct animal-related greenhouse gas emissions per farm, smaller manure quantities, and correspondingly reduced methane and nitrous oxide emissions from manure management.

In these aspects, we have a clear mitigation benefit from organic farming. However, all these strategies closely link to extensive production systems with lower outputs. Thus, the lower output in these systems may lead to so-called "leakage" of emissions if the missing produce is just sourced from elsewhere, with corresponding emissions occurring there. In this case, relocation rather than net reduction of emissions would take place. Hence, the danger prevails that the reduced emissions from these systems will come at the expense of leakage, unless complementary changes on the consumption side are realised as well. This aspect is reflected by the fact that many studies find organic farming to have higher emissions than conventional farming if related to the output rather than to the farmed land area. Framed differently, the yield gap between organic and conventional agriculture is central here and puts the aggregated mitigation potential of organic farming into perspective.

MITIGATION IS IMPORTANT, BUT ADAPTATION POTENTIAL CARRIES MORE WEIGHT

However, mitigation is by far not the only and most important topic when it comes to climate change and agriculture. In fact, adaptation to climate change is much more important for the individual farmer and for food security. The livelihoods of hundreds of millions of people directly depend on successful climate change adaptation practices and strategies in agriculture. Organic farming shows considerable potential for successful adaptation related to soils. Soils under organic farming generally show a higher soil quality, characterised by higher organic matter contents, more active and diverse (micro)organisms, and better soil structure. Such fertile and healthy soils support stable production. Furthermore, the physical characteristics of soils under organic management lead to generally higher water infiltration and water holding capacity. This results in an increased resilience in the face of extreme weather events such as droughts and heavy rains. Such enhanced capacity to regulate the soil water cycle is central for successful adaptation in agriculture, as such extreme events are projected to increase in frequency and strength with ongoing climate change. In consequence, yields may be more stable in organic farming, thus contributing to more resilient livelihoods.

Another key aspect suggesting a considerable potential for successful adaptation in organic farming is diversity. Organic farms show a higher diversity of crop varieties, animal breeds and often also semi-natural habitats, which supports resilience against adverse impacts of climate change and provides the basis for intact ecosystem services provision, such as biological pest control. This is important in the context of climate change, as it is expected that pest and disease pressure will increase in many regions. Furthermore, new plant pests and diseases facilitated by trade, management intensification and climate change will have an impact on agricultural productivity. Organic farming with its high diversity of habitats, species and management practices is able to show high resilience in respect to pests and diseases. The tendency to work with locally adapted varieties further works in the direction of in-

Soils after heavy rain under organic (left) and conventional management – thanks to the better soil structure, organic agriculture is better able to deal with extreme events, which are likely to increase in frequency with climate change.

Photos: Research Institute of Organic Agriculture FiBL

creased resilience against the adverse effects of climate change.

One important element of adaptation strategies is precise and concrete local information on the impact of climate change, for example regarding crop suitability, or risk assessment for pests and disease outbreaks. Especially for organic farmers such an "early warning system" can be highly relevant, as they have no quick-fix method to tackle pests with pesticides. Moreover, organic farming is knowledge-intensive, and organic farmers particularly depend on being knowledgeable about their land, soil, ecosystems and biodiversity situation and its changes and development. They are thus likely to be particularly sensitive to changes, allowing them to react early and well-prepared.

A LOT OF STAYING POWER IS NEEDED

There are thus many indications of an improved performance of organic farming in the face of climate change impacts. Research efforts steadily increase, but review work to gain more aggregated and robust knowledge on this is still scarce, which is due to the fact that measuring successful adaptation is much more complex than measuring successful mitigation. Successful adaptation is only visible after several years or even a few decades. This would require long-term commitments of international research funding, which is seldom possible in the current research context with its rather short-term visions between three and five years maximum. The situation is different for mitigation achievements such as avoided greenhouse gas emissions, which can already be assessed on an annual basis.

Unlike for mitigation, where indicators per unit of output are used for communication, it often makes less sense to link adaptation services to the product quantity only. To a substantial degree, adaptation indicator performance is linked to agricultural area, farm, household or regional level. Thus, the yield gap is only of secondary importance for this.

On the contrary, one could even argue that more extensive systems such as organic farming, where farmers crop larger areas with lower yields but better adaptation prospects, provide more resilient livelihoods for the whole community than intensive conventional production. Furthermore, organic farming systems allow for a number of further environmental, economic and social co-benefits. These include reduced eco-toxicity, lower energy use and lower eutrophication potential per area, or reduced input costs and consequently higher profitability, for example.

LIVELIHOOD STRATEGIES

Organic farming can thus be seen as an overall strategy for sustainable livelihoods beyond the benefits for climate change mitigation and adaptation. Reduced input costs and higher profitability, for example, directly work towards an improved livelihood basis. These benefits do not relate to climate change adaptation only, but contribute to sustainable livelihood strategies in the face of many other challenges, such as demographic change, lack of employment opportunities or migration. Along this line of thought, the importance of the yield gap also dwindles. It is one aspect among many others for a sustainable livelihood strategy, while it can dominate results when focusing on the climate change mitigation potential per unit of product.

We emphasise that by this discussion we do not want to posit that low or high yields do not make a difference. The aim of the discussion is to put the role of yields of agricultural production systems and yield differences between such in a wider context and to highlight that they are only one important indicator among many others. All other aspects, such as inputs, being equal, higher yields are usually clearly better for the farmer as they directly relate to higher revenues – unless oversupply results from high yields on many farms, thus resulting in corresponding drops in prices on the market.

THE FOOD SYSTEMS PERSPECTIVE

Despite the advantages of organic farming regarding climate change and livelihood strategies, the challenge of leakage of production still remains. Therefore, we need to ultimately adopt a food systems perspective to discuss the role of organic farming in climate change mitigation and adaptation. On a food systems level, food security is provided by supplying enough products to meet the demand (thereby for once neglecting the central aspect of adequate distribution and access to food). If production falls short due to lower yields, the solution does not necessarily lie in yield increases at all costs. We could rather focus on reducing the demand. In our current food system, working on demand is best possible along two lines. First, there is the option to reduce consumption of animal products and correspondingly reduce demand for concentrate feed from croplands that is in competition with direct human nutrition. Second, it is possible to reduce demand via reduced food wastage, given that about a third of today's production is wasted or lost. Working on these aspects of demand can result in lowering the demand to a level that easily can be met with lower yields.

We emphasise that this discussion is geared to an aggregated view in the context of increasing incomes, growing middle-classes also in low-income countries, and correspondingly increasing demand for animal products in a "business-as-usual" projection. We are aware that there are many contexts where this discussion would be downright cynical, where demand reduction is no option. Albeit, there too, reducing post-harvest and storage losses may often contribute to improvements and works similarly to demand reductions. This is all the more important in the context of climate change, where yield forecasts report much lower increases than realised in the past, down to stalling or even decreasing yields for key crops such as rice, wheat or maize. In such a context, the yield gap may even narrow, given the indications that organic farming performs particularly well regarding adaptation to the threats of climate change.

COMBINING THE BEST OUT OF ALL SYSTEMS

So, what does this all mean? It means, first, that climate change mitigation potentials in organic farming are real but should not be overestimated. Second, mitigation should not be addressed by focusing on the production side only. It is a central topic to be discussed on a food systems level where demand patterns are essential, too. Third, it means that organic farming is a promising strategy for climate change adaptation. There too, though, a mere focus on climate change is too simplistic. Organic farming is a sustainable livelihood strategy that has promising effects along a broad number of indicators where climate change adaptation relates to a subset only. Fourth, it means that in all this, organic farming may serve as a blueprint for sustainable agriculture, also contributing to improving non-organic approaches. The debate should not result in quarrels on which production system may be better or worse regarding climate change mitigation and adaptation. It should rather identify where the strengths and promising practices of each production system lie and how these may be transferred to and implemented in other contexts, to the benefit of all stakeholders.

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TOOLS FOR RISK ASSESSMENT

Tackling risks arising from climate change, environmental degradation and natural hazards in an integrated manner is one of the greatest challenges of today – notably in development co-operation. These risks significantly influence the resilience of systems and communities thereby often threatening the poorest disproportionally. There are several tools to integrate climate, environment and disaster risk reduction (DRR) aspects into development co-operation to safeguard development achievements. One such tool is the **Climate, Environment and Disaster Risk Reduction Integration Guidance – CEDRIG**. It helps development and humanitarian actors to reflect whether existing and planned strategies, programmes and projects are at risk from climate change, environmental degradation and natural hazards, as well as whether these interventions could further exacerbate these challenges.

The guidance is composed of three modules: CEDRIG *Light* will help you to decide whether a detailed risk and impact assessment must be conducted or not. It is proposed to be conducted individually or by involving only a few relevant stakeholders for maximum two hours. In case of a 'yes', CEDRIG *Strategic* will help you to analyse strategies and programmes, while CEDRIG *Operational* will be applied for projects. Both are proposed to be conducted in a participatory manner by organising a workshop with all relevant stakeholders. Its duration can vary from 1.5 to 3 days depending upon the scope, interest and availability of the participants and whether a (recommended) field visit is feasible. The end result of the analysis will include concrete identified measures to improve the strategy, programme or project along with respective actions and indicators to monitor their implementation.

CEDRIG offers the possibility to invite the workshop participants (and others) to access each application and thus to create a team. It further allows storing documents including pictures. An offline version of CEDRIG is available that allows to use CEDRIG while not being connected to the Internet. The content can then be easily transferred into the online version. Currently CEDRIG is available in English, French and Spanish – a Russian version is under development.

The Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL) was designed to help users design activities that support climate adaptation (i.e. adaptation to climate variability and change) at the community level. It helps them to identify and prioritise climate risks that their projects might address. CRiSTAL seeks to systematically assess the impacts of a project on some of the local determinants of vulnerability and exposure, so that project planners and managers can design activities that foster climate adaptation. The tool is available in English, French and Spanish.
More information: www.cedrig.org; www.iisd.org/cristaltool