Keynote for OrgaTrop 28-29, 2021 (online conference)
(https://orgatrop.faperta.ugm.ac.id/)

Organic farming in the context of climate change and vice versa

Gerold Rahmann

- President of the International Society of Organic Farming Research (ISOFAR)
- Director of the Thuenen-Institute of Organic Farming, Germany
- Professor at the Faculty of Organic Agricultural Science, Uni Kassel, Germany

gerold.rahmann@thuenen.de

Introduction

Organic farming is considered an environmentally sound food production system. Over 3 million farmers produce more than 70 million hectare farmland food in a market value of more than 120 billion US-Dollar (IFOAM & FiBL 2021). Organic farming has been growing for decades and is practiced in more than 187 countries, which support Organic farming by national or international programmes (e. g., the EU wants 25% Organic farming until 2030, Sri Lanka, Bhutan and some states in India are even targeting 100% in the near future), to increase the amount of converted land, farmers and food market share. Despite these goals, Organic farming currently contributes to only 1.5% of the global farmland (mainly semi-arid grassland) and less than 0.5% of the global food market (premium price sector).

The global challenges of climate change, loss of biodiversity, water security and, last but not least, growing food demands for still increasing populations challenge Organic agriculture, like all farming and food systems. How is Organic farming impacted by climate change and how can Organic farming help mitigate greenhouse gas emissions and adapt on climate change?

Mitigation: Organic farming can help to reduce GHG emissions

To reduce the pacing of the climate change, the international community has agreed 2015 in Paris, to do everything to limit global warming temperatur rising by +2 °C, preferably to +1.5 °C (UNFCCC 2015). Farming contributes up to one third of the greenhouse gas emissions (UN 2021a). Cropping and fertilizer production with fossil energy, Organic matter losses in soils and methan emission in rice and ruminant production add to the greenhouse gas emissions, mainly due to the fact that fossil energy is still very cheap in comparison with renewable energy and the turnover of food production and farming income is still high (in many cases because of subsidies). “Food First” is continuing to be the strategy of many countries and organisations to solve one of the main challenges of mankind: the Sustainable Development Goal no. 2 of the United Nations (zero hunger) (UN 2021b), plus the other 16 SDGs aswell.

Adaptation: climate change forces a shift to Organic farming

Worldwide, climate is changing (IPCC 2021a) and farmers experience this by extreme and unpredictable weather calamities. Droughts, thunderstorms, extreme rainfall and floods are damaging crops and soil. Desertification and erosions are more and more often destroying our food production basis: soils and its fertility. A decreasing soil fertility is dangerously

harmful, thinking of a growing global population reaching up to 9 to 11 billion people in 2050 (Rahmann *et al.* 2021). There is a severe and urgent need to adapt the farming and food systems to cope with the impacts of climate change (FAO 2021, IPCC 2021b). Solutions are in changing cropping patterns, sustainable fertilizer production, food waste reduction, less livestock production (McKinsey 2020) and agroecological approaches to optimize the farming systems (FAO 2021b).

Discussion: transformation of Organic farming

Some scientists (e. g. Smith et al. 2019) and decision makers are still doubting that Organic farming is able to meet all challenges and expectations of future food chains. But there are also many scientists who see Organic farming as an agroecological approach (FAO 2021b), which can contribute to reduce GHG emissions and produce enough food for everyone, healthy and affordable (Rahmann et al. 2017). But both, sustainablity and productivity, will need improved Organic farming systems. Main development pathways need to be in the context of the principles (IFOAM: health, care, fair, ecology) and goals (e.g. EU reg. 848/2018 §§ 4-7) of Organic farming: increasing or stabilizing Organic matter in soils, utilize renewable fertilizer and energy, integrate carbon sinks like shrubs and trees (agro-silvo-pastoral systems) and, last but not least, to keep less livestock and feed less food (concentrates like maize, soy, grain, etc.).

The reduction of livestock numbers per hectare and the local feed production are significant contributions of Organic farming to reduce GHG emissions. Nevertheless, zero livestock systems are difficult for Organic farming. Particularly ruminants are important for Organic farming in semi-arid grassland areas (Australia, Africa and America), they produce manure for fertilizers and, last but not least, have a high economic contribution on farm income. On the other hand, Organic farming has to become more productive. Compared to conventional high performance farming the yields are low, the product qualities have difficulties in trade and the high price hinders the scaling-up of the consumption.

Modern “plant based food habits”, like vegeterian and even vegan diets, are becoming increasingly popular throughout the world and are already challenging Organic farming systems who still argue pro-livestock keeping. For Organic farming, plant based food diets are strong competitors and/or partners. More plant based approaches need to be developed in Organic farming to establish reliable partnership with such trends.

Conclusion

No doubt, Organic farming is an option for sustainable farming and food chain in the context of the SDGs of the UN and the Paris agreement in contribution to mitigate GHG emissions. However, Organic farming has to change and adapt to be fit for future challenges of the food chain “farm to fork”.

Organic farming can and must contribute to mitigate GHGs, though the contribution is not high enough yet, despite the promises and goals. GHG emissions are comparably high like in conventional farming. To become better in GHG mitigation, Organic farming regulations and the efforts in practice need improvements. Furthermore, all farming systems and production patterns must change to become more resilient against weather extremes and climate change impacts aswell as to be productive and profitable.

Organic farming has to become more productive and even more sustainable aswell. The yields are too low in comparison with conventional farming. Some regulations hinder better production and higher yields. Mineral fertilizer like urea are not bad, if they are produced sustainable (renewable energy in processing) and not too much is applied (avoiding eutrophic conditions in waters and nitrate in drinking water). The usage of human feces and urin have to be reintroduced to farming to ensure real nutrient cycles, this process is prohibited in many countries. Pest and weed control can be improved through seeds with higher tolerance and resistance, better crop rotations in context of weather extremes and yields, and better weed and insect control, using mechanical and biotechnological knowledge and skills. Renewable energy must be an obligation for all food and farm procedures.

The development of "zero budget GHG emissions and productive Organic farming" is necessary and must be achieved in the next two decades. Time is running.

Organic and conventional farming can learn from each other, if there is a common understanding of goals, needs and sustainability. Diversity in farming systems has always been important for a healthy development, but not as enemies but competing partners. Scientists and researchers can help to overcome gaps and barriers in communication and development.

ISOFAR is ready to contribute.

References

FAO (2021a) Climate change. http://www.fao.org/climate-change/en/

FAO (2021b) Agroecology. http://www.fao.org/agroecology/home/en/

IFOAM & FiBL (2021) The world of Organic Agriculture. Statistics and emerging trends 2021. https://www.fibl.org/fileadmin/documents/shop/1150-Organic-world-2021.pdf

IPCC (2021a) Climate Change 2021. The Physical Science Basis - Summary for Policymakers. https://www.de-ipcc.de/media/content/AR6-WGI-SPM.pdf

IPCC (2021b) Climate Change and Land. Special report. https://www.ipcc.ch/srccl/

McKinsey (2020) Agriculture and climate change. https://www.mckinsey.com/~/media/mckinsey/industries/agriculture/our%20insights/reducing%20agriculture%20emissions%20through%20improved%20farming%20practices/agriculture-and-climate-change.pdf

Rahmann, G., Ardakani, M.R., Bàrberi, P. *et al.* (2017) Organic Agriculture 3.0 is innovation with research. Org. Agr. 7, 169–197. https://doi.org/10.1007/s13165-016-0171-5

Rahmann, G., Grimm, D., Kuenz, A., Hessel, E. (2020) Combining land-based Organic and landless food production: a concept for a circular and sustainable food chain for Africa in 2100. Org. Agr. 10, 9–21. https://doi.org/10.1007/s13165-019-00247-5

Smith, L.G., Kirk, G.J.D., Jones, P.J. et al. (2019) The greenhouse gas impacts of converting food production in England and Wales to Organic methods. Nat Commun 10, 4641. https://doi.org/10.1038/s41467-019-12622-7

UN (2021a) Food systems account for over one-third of global greenhouse gas emissions. UN news. https://news.un.org/en/story/2021/03/1086822

UN (2021b). The 17 goals. https://sdgs.un.org/goals

UNFCCC (2015) The Paris agreement. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement