Going organic - A Critical Analysis of the Potential for Organic Farming in Ethiopia

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Abstract

In this article we analyse and discuss how organic farming can be understood, in general, as a means to contribute to the sustainable development of smallholder farming systems. Drawing on our fieldwork in Ethiopia, we argue that organic farming systems is offering several systemic solutions to address some of the well-known agricultural challenges in tropical and subtropical regions, but also needs further development. Without question, organic smallholder farming requires many fundamental transformations in the agri-food system as a whole and in their institutions and organisations, the extension, research, the market and the policy system. Going organic could be an option, but it would require a fundamental change to include crop rotations, alley farming and biogas plants, pasture and animal husbandry management and other technologies in a collaborative i.e. community approach.

Introduction

Smallholder farmers in tropical and subtropical countries confront numerous inter-related internal and external challenges. These can be subdivided into three sectors.

Land: farm size is limited with approximately 0,5-2,0 ha per farm; there is pressure on communal land through growing population and land grabbing; and finally, farmers' land rights are limited.

Production: extensive soil erosion, soils pH often-below 5, low soil fertility. Farmyard manure is often burned; animal density is nearly 100% above the carrying capacity of the land; a decline of natural forests; lack of crop rotation, ploughing with oxen up to five times; low seed bed quality; no application of lime; harvest and post harvest losses are up to more than 50%; inadequate or non-existent storage facilities and processing equipment.

Markets: weak value chains and linkages to markets; high fees demanded by market brokers; export crops like vegetables or flowers, or organic coffee or honey, currently do not offer an opportunity to raise farmers income.

The above snapshot describes the living conditions of rural farm households and documents the situation of the agricultural sector in Ethiopia. Can a transformation of agriculture towards organic farming solve these problems? And what might be the framework for a bio3.0 in tropical and subtropical regions?

Material and methods

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Our study took place in three areas around the Dangila (rain fed), the Merawi (Koga irrigation scheme) / Amhara Region and in the Awassa Region (semi-shadow coffee production). Our case studies illustrate many of the practices and challenges confronting smallholder farms in Ethiopia. From January to May 2016, we conducted a situation analyse (farm interviews, field walks, and field observations) on ten smallholder farms. The commonalities between farms allow us to classify them into three smallholder model farms-local, high input and organic-in terms of their applied materialities i.e. techniques (plants, animals, machines, tools). We sought to make visible the challenges smallholder farmers confront in establishing an environmental friendly i.e. organic and economically viable farming system. We conclude with some observations about the complexity of a system change from traditional / conventional to organic farming.

Results and Discussion

(a) Farming systems

- Local farm around Dangila

This widespread farming system in the Amhara region is approx. 1 ha in size with limited access to modern agricultural techniques. Inter-related subsystems and elements are: arable land mainly for cereals, potatoes and some vegetables; cows, goats, sheep, hinnies, chicken; forage basis; overused communal pasture land and straw; furthermore some fruit trees, eucalyptus and beehives (organic production). External inputs: small amounts of mineral fertilizer and feedstuffs (residues from local breweries or *niger* oil seed cake). Outputs are cereals, heifers, honey and some milk and meat, primarily for subsistence or for the market during the non-fasting season. In short, as a result of traditional crop production methods and a limited investment in agroforestry, the highly eroded soils have low levels of fertility with low humus content and low water holding capacity. In addition, insecure land tenure hinders investment in sustainable practices (Holden & Yohannes, 2002), such as liming or tree planting. The use of external inputs is low. Nutrient cycles are open and nutrients are lost via ongoing water and wind erosion that negatively affects crop yields as well as both milk and meat production. The materiality of the hand hoe, the oxen plough, or hinnies for transportation, conserve traditional practice formations, on the other hand there is no financial background for any investment to initiate a fundamental change.

- Intensified farm in Merawi / Koga irrigation scheme

This farm model with approximately 1,5 ha is relatively privileged due to its location in an irrigation scheme. Two cereal harvests per year, and even a third crop, and access to markets has led to increased incomes. But it is coupled with the inefficient use of fertilizers and pesticides. Because of the lack of organic matter, and liming to increase low pH, crop rotations with forage legumes, these practices lead to pest and diseases, soil degradation, compaction, acidification and ground water contamination through agricultural inputs. Neither the financial nor the human capital is available for taking a technologically or an environmentally positive step forward. There is also a lack of machinery to reduce the workload, while oxen plough and hand hoe is still the standard "mechanization".

- Mixed organic coffee farm in the Awassa region

Our third model is a mixed organic coffee farm in Awassa region where certified organic coffee is cultivated under half shade with approximately 2 ha. It also includes several elements primarily of the first model (some crops, animals, fruit trees). Organic coffee production demonstrates a way forward toward biodiversity, healthy soils and plants. But due to the low quality of compost management and green manure practices, natural resource management needs to be improved. Similar to the other farm types there is a lack of investment in technology and in several techniques that could improve productivity. We conclude that farm income based on approximately 2 ha in

mixed coffee farms is enough to maintain the household. But even the higher organic price for export coffee does not make a serious step forward in their economic situation.

(b) Potentials and challenges to go organic

Based on the above farm models and experiences from the literature, we explore the opportunities and investments required to convert to organic or to optimize the production system, while any the economic and market issues asks for another analysis.

- **Cropping and fertilizer systems**

There is evidence that intercropping (Akande et al., 2006, Dwivedi et al., 2015, Fujita & Budu, 1994, Mpairwe et al., 2002, Nedunchezhiyan et al., 2011, Nnadi & Haque, 1986), the use of farm yard manure (Ayoola & Makinde, 2008), and the use of forage legumes, e.g., alfalfa, clover or desmodium combined with alley cropping (Birech et al., 2014, Shibabaw et al., 2016) has the potential to compete with farming systems based on mineral fertilizer. Crop diversification with forage legumes (mandatory for organic farming) can also contribute to soil fertility and reduce weed pressure. Through the establishment of biogas, slurry can be sprayed to increase the cereal yields; the compost can be applied on potatoes and vegetables; and gas used in the kitchen can contribute to a more efficient energy system. Such a system could save labor for collecting fuel wood and money for charcoal as well as reduce the health risk of women while cooking. The challenges are the availability of forage legume seeds, the knowledge for the management of legumes and alley cropping, mechanical weed control and the collection and transportation and spraying of farmyard manure and slurry, and related additional labor. Still not put in practice is the manipulation of the pH through liming strategies, which would lead to a serious increase of plant nutrients availability and with that a relevant increase of yields (van Straaten, 2002).

- **Animal husbandry and feeding strategies**

To go organic, re-configuring the use of crop and pasture lands will be central in each model. Overgrazing has led to significant yield declines in forage crops that can be compensated by cultivating improved forages (such as alfalfa, clover, napier grass, etc.) and pasture management. Currently, forage legumes only cover 0.25 % of the animal nutritional need in Ethiopia (CSA, 2010b) and 0.18 % of animal feed needs in the Amhara Region (Firew & Getnet, 2010). Increased dairy productivity is tied to access to protein and starch rich green fodder and hay from leguminous plants and grass varieties (CSA, 2010a). Animal traction and threshing are one of the main reasons for keeping cattle on each of the farm models. However, the reduction of the number of animals is needed to avoid soil erosion and compaction on arable and pasture lands. Thus, there is a nexus between mechanization, the reduction of animals, workload and environmental damages.

- **Labor and mechanization – biogas and weed control**

Without exception, the farms are already extremely labor intensive. Consequently, the additional labor required in the move to organic integrating forage production, alley farming and compost / slurry spraying always raises critical questions. Compost management and sprayers to reduce labor are only affordable with external financial support and/or through a cooperative approach in which farmers share the investment and maintenance costs of modern technology. Cooperatives would have the potential to invest into machinery, but requires external start up capital from outside. Investment into zero grazing units combined with a half-day pasture system would allow the collection of farmyard manure for biogas production. Farmer or communal groups could invest in compost sprayers and improved techniques for cutting and transporting clover from the crop rotation; mechanized weeding with a horse-, an ox- or a tractor-drawn weeder would significantly reduce the farm workload. Affordable biogas systems on household level already exist (Puetz et al. 2011) and contribute to serious reduction of household workload.

Conversion specific challenges

There is no doubt that organic management methods (legume forage, alley farming, mulching, biogas production) require additional labor and need time to be successfully implemented on smallholder farms. The higher workload can be compensated through mechanisation of soil tillage. Forage legumes contribute to weed suppression and nitrogen fixation. Reduced expenses provide opportunities for investments into biogas plant and hand hoe labor / technology for weed control through the reduction of expenses for mineral fertilizers, herbicides and pesticides. Biogas slurry contributes to higher cereal yields and clover finally is the basis for higher productivity in the dairy sector, which is estimated with an increase from currently approximately less than 1 to 3t milk per cow and year.

Increased crop yields can be expected only after the second year from the following practices: direct pre-crop effects of legumes, the application of farmyard manure / slurry and the use of cuttings from alley trees. That is, this time gap between the investment in organic practices, and the economic return during the conversion period presents a key challenge for a system change. Several types of incentives would be needed to motivate farmers to move to organic, e.g. high support through advisory services, and technical support and investment into organic farming research.

Conclusion

We have shown that the organic approach offers a means to address decades of damage to the natural environment. It also opens a "repair shop" for soils, humus content, nutrient cycles, pH, biodiversity, crop rotation, alley and tree farming, forage quality, etc. – or in other words resetting the farming system.

The analysis further makes clear that there is need for an intensification of production. Several organic system technologies and practices can help solve some environmental challenges and in the meantime increase meat, milk and crop production over the long term. But this will be only possible with investments in technology (e.g. adapted soil tillage, mechanical weed control or biogas / composting techniques); and this investment should be done in a cooperative or a community.

Beyond the farm boundaries, it demands a transformative change in the local, national and international markets – current organic and fair trade systems alone cannot stabilize the farm economy -, including the broader rural and urban development policies, education, training and research investment into organic farming strategies.

Coming back to one of our questions at the very beginning – a "bio.3.0-framework" under tropical and sub-tropical ecological, societal and political conditions is a means of resetting the farming systems, includes both farm and household via the nexus of food / organic matter / energy and water and can be seen as an instrument to solve fundamental weaknesses of the agri-food system as a whole.

References

The references can be send by request through the first author.