Syprobio: Farmer-led innovation platforms to address food security, poverty alleviation and resilience to climate change in West African cotton-growing communities

Gian Nicolay[1], Rémy Dabire[2], Andreas Fliessbach[1], Laurent Glin[2], Fagaye Sissoko[3]

[1] *FiBL Switzerland, Ackerstrasse, CH-5070 Frick, Email:gian.nicolay@fibl.org*

[2] *FiBL West Africa/IER-CRRA(Institut d'Economie Rural-Centre Regional de la Recherché Agricole)*

[3] *IER-CRRA/ FiBL West Africa*

Keywords: farmer-driven research, transdisciplinary research, decentralized processes, organic cotton systems, West Africa

Abstract

The social problem of food insecurity and the challenge for farmers on adapting successfully to climate change in West African societies build the framework and scope of our research for development. It is addressed through a project called Syprobio and operating in the three countries of Mali, Burkina Faso and Benin. Elected farmers, representing 2 – 3,000 organic farmers are conducting on-farm research and cooperating with 40 – 50 researchers and technicians in testing 27 innovative practices by forming innovation platforms. Soil fertility, seed improvement, pest management, agronomy and socio-economics are the main themes. The innovations to be tested shall improve food security and climate change adaptation. The main research for development methods used are transdisciplinarity, actor-network theory (Latour, 2005), focus group discussions and decentralized action-research hubs. The innovation, the testing farmers and the researcher built an actor-network. After 2 years, all 10 circles of concerted actors (CAC) are productive and started in 2013 the second round of testing their selected innovations. The main concern of the farmers is the low soil fertility. Both farmers and researchers learn mutually, as well as the technicians from the farmer organizations. The creativity, determination and curiosity of the self-organized farmer groups, embedded in a supportive research network and exiting value chains, allow fast and effective identification of innovations to be tested and implemented. It is recommended to further invest in better alignment at national level of farmer needs, research methods of NARS and universities and policies in order to create functional institutions.

Context

The current social, economic, climatic and ecologic situation in West Africa constitutes both practical and intellectual challenges. Agriculture and food systems are in the hard of this "multidimensional complex" (ECOWAS, 2008). Soil degradation, pests, hungry farmers, uncertainties on the changing climate, rural-urban cleavages, civic unrest and wars as well as resource-poor states and fragile societal structures provide a dangerous mix for social stability and peace in the region. Organic agriculture is growing in Africa, as it is seen by its proponents as an appropriate way to address food security, land conservation, poverty and adaptation to climate change (IAASTD, 2009, Bouagnimbeck, 2013, Nicolay, 2012, Scialabba and Müller-Lindenlauf, 2010). From 50,000 ha in the year 2000, it increased to more than one million ha in 2010. Cotton is one of the most important cash crops providing rural income in the sub-Saharan savannah. Cotton farmers are always cereal farmers, and often among the most productive, as they have better access to inputs through their close market and industry links. Organic cotton is produced by roughly 18,000 smallholder farmers in the subregion. The organic producers use the same non-genetically modified (GM) seed varieties as the conventional farmers but make use of locally produced compost and biopesticides as inputs. Cotton is attacked by numerous pests, making pest management an important and demanding activity. Producing sufficient compost is laborious (problem of water and small equipment) and the biopesticides, because instable, have to be applied frequently[1] as they often have a contact or repellent property that can by washed off the plant surface. The introduction of GM cotton varieties in Burkina Faso in 2008 is a growing risk for organic producers, as their premium price will be lost in case of contamination with GM cotton[2]. Soil fertility is another major issue for organic producers, because knowledge is often lacking in producing the required organic matter, even if nutrients are made available by the active soil microflora. The loss of soil organic matter (SOM) has reduced the stability of soils towards erosion that often occurs after heavy rainfall and increases the risk of losing the most fertile topsoils. Cotton production is a highly political issue with contested policies worldwide. The price fluctuations of this global commodity are particularly great in West Africa, as this subregion exports most of the cotton lint, mainly to China.

The need for a new research paradigm and the introduction of innovation platforms

The high demand for organic and fair-traded cotton cannot be met by supply (Pay, 2009). The complexity of this commodity – high requirements on the soil, pests, price fluctuations, political interference, pressures from input suppliers and importers, strategic role of the ginning industry, GMO threat, competition with newly emerging cash crops (mainly from horticulture, cowpeas and sesame), policy tradeoffs – requires new ways of agricultural research. Concerted action bringing together the stakeholders is an indispensable requirement for structural and technological change and is tested inside the EuropeAid funded Syprobio project (2011-2015). The Syprobio project is based on the existing organic cotton value chain developed by

[1] In Mali up to 7 applications

[2] If the contamination with GM cotton is >0.9% and detected by certifiers, the premium price will be lost; i.e. 20–50% reduced price. This happened twice in the last four years in Burkina Faso, where 10% of the organic cotton had to be declassified (source: Helvetas).

Helvetas since 1999 and reinforced by national (IER, INERA[3], INRAB[4]) and international (FiBL) research organizations. Theses actors, centered on the locally organized researcher-farmers, constitute innovation platforms to promote appropriate technologies favoring the livelihood and increasing the family or household farming resilience. Innovation platforms (IP) are here defined as social systems with the purpose of solving its member's problems through concrete and systematic communication in order to produce or construct desired innovation. The platform adopts innovation as a systemic and dynamic institutional or social learning process and recognizes that innovation can emerge from many sources (science or indigenous knowledge or else), complex interactions, and knowledge flows. IP's are also seen as a practical tool to find solutions in an effective, nation-wide and sustainable way (Adekunle, 2012). In the Syprobio project, they are composed on average of 10 organic farmers from the neighborhood, 3 technicians-extensionists and 2 researchers. The complexity and multidimensional character of the issues of food insecurity and climate change adaptation (CCA) in West Africa inspired the framework and scope of our research for development. The objective of this project is to produce practical and scientifically tested technological innovations likely to improve soil fertility, crop diversity, yield stability and food security in a context of climate change. The following core hypotheses are being tested by the project: (1) Relevant technologies for small-scale farmers leading to food security and CCA for both organic and conventional farmers can be invented and implemented by farmer associations designed specifically for that purpose; (2) Soil organic matter (SOM) is required for soil stability and fertility to attain resilient and sustainable yields; organic farmers have advantages in reaching sufficient SOM levels; (3) Innovations invented and tested jointly by farmers and researchers are more likely to be adopted than those invented and tested solely by farmers or solely by researchers; (4) Adoption of jointly developed technological innovations will result in more robust agricultural and food systems that will improve food security and can contribute to economic integration and nation building.

Use of various research methods

We used a series of methods and concepts including theorizing, transdisciplinarity, actor-network theory (Latour, 2005), focus group discussions, decentralized action-research and systems theory (Luhmann, 1995). The discipline of sociology was chosen to guide the research itinerary and its semantics and to stimulate creative research ideas driven by observation and by empirical data in order to stimulate discovery (Swedberg, 2012). We produced a heuristic "theory of Syprobio" in the form of a visualized system of the interconnected bio-physical and sociological factors that determine the ideal cotton-based agriculture system in the context of climate change (Fig. 1). Decentralized hubs were created – 10 concerted actor circles (CACs)[5] and 3 national Syprobio networks – which are evolving into innovation networks. The innovation, the testing farmers and the researcher form an actor network. In each country, a farmer organization, a research institution and the local office of Helvetas are partners of the project coordinated by FiBL Switzerland and its local office FiBL West Africa in Sikasso, Mali. In a first step, farmer groups (CACs) of

[3] Institut de l'Environnement et des Recherches Agricoles
[4] Institut National de Recherche Agronomique du Bénin
[5] French: "centres des acteurs concertés"

10 farmers each were formed in 10 subregions from southern Mali and southern Burkina Faso to northwest Benin (Fig. 2).

Figure 1: The Syprobio theory as a heuristic tool at the early stage of the research-for-development itinerary

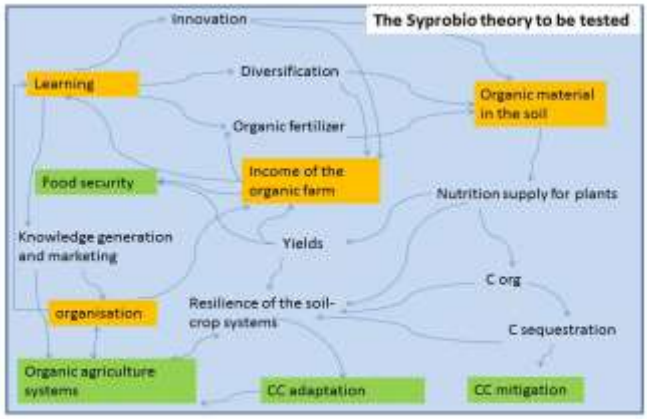
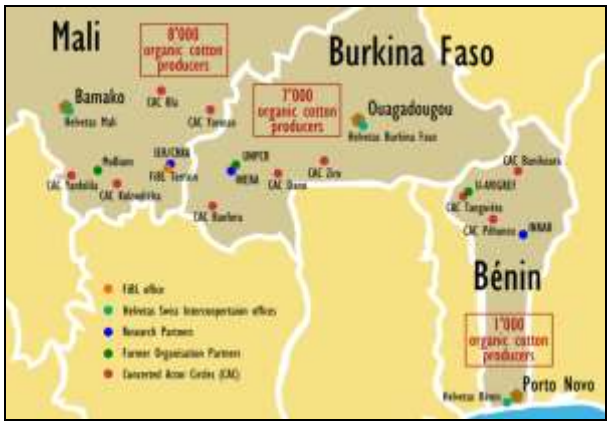


Figure 2: Distribution of the main actors in the innovation network of cotton farmers, farmer organizations and research institutions



They defined their constraints and questions to be solved, leading to a list of 166 questions and problems. Through a series of multi-stakeholder roundtables, researchers and advisors sorted the list and came up with 27 topics that were to be tested in farmers' fields. The farmers of each CAC, representing 600–2000 organic farmers each by mandate, were then asked to conduct on-farm research in close collaboration with 30–40 researchers and advisors in the three countries. Soil fertility, seed improvement, pest management, agronomy and socio-economics are the main research themes of the organic cotton-cereal farmers. The innovations being tested should improve food security and CCA.

Table 1: Number of innovations tested in the different domains as defined by farmers, advisors and researchers in the three countries

Country	Soil Fertility	Seed	Plant Health	Cultivation	Socio-economy	Total
Mali	2	3	1	2	1	9
Burkina Faso	2	2	2	1	2	9
Benin	4	-	2	2	1	9
Total	8	5	5	5	4	27

Source: Project Syprobio, 2012

Results after two years

All 10 CACs are working well as innovation platforms and actor-networks. Innovations tested in 2012 are currently (2013) repeated in a second round. Two innovations related to seeds are already conclusive and will go for scaling-up. The main technical concern of the farmers is still the low soil fertility and the technical and socio-economic constraints in overcoming it. Apart from the 8 innovations to be tested within the project scope (see Table 1), on-station trials, literature search and cooperation with like-minded networks

and organizations are done. From the nontechnical side, the bleak situation related to credit outside the conventional and GM cotton value chain as well the poor rural advisory services are major concerns. Many farmers cannot work their land because they lack draught animals or cannot buy the inputs they need to optimize their farm operations. Both farmers and researchers learn mutually, as well as the technicians from the farmer organizations. This learning has to be transformed into actions of systemic change. On-station experiments have been launched in the three countries to address some specific issues (e.g. assessing the risk of cohabitation with GM cotton). One of the most remarkable impacts so far is the farmers' increased trust in research and the new self-confidence in self-organized processes. It is to be seen how this momentum can be transformed into larger social change within the rural cotton communities.

Lessons learnt, challenges and recommendations

The creativity, determination and curiosity of the self-organized farmer groups, embedded in a supportive research network and existing value chains, allow fast identification of innovations to be tested and applied. Local resources (biological agents, social capital, experiences) are used and experimented on field and village level. The main challenges are in communication, cost reduction for field visits by researchers and institutional stability and durability (research, farmer organizations, markets). The participatory approach that is at the center of our research method and materialized through the IP's enables interactive and social learning among the involved stakeholders. Farmers' capacities to analyze and make decisions are improved. It is recommended to further invest in better alignment at national level of farmer needs, research methods of national agricultural research and universities, and policies in order to create functional institutions. Social systems theory can be used more to improve the understanding of the required systems, i.e. (i) politics with the nation-state (including the ECOWAS subregion), (ii) economy with the subsystem "food and agriculture", and (iii) science of agriculture and rural development as part of the science system.

The food and agriculture system is part of the economy but also has implications in society and ecology. A new way of perceiving this system "as a system" through transdisciplinary approaches can lead to more balanced solutions than in the past. Agricultural science is distinct from economy, society and politics through its own purposes and language. Good communication between these three systems – science, economy and politics – will be required to successfully scale up the promising innovations and make them fruitful for the two million cotton farmers in West Africa. The concept of "greening the economy with agriculture" (FAO, 2012) provides a framework aligning local to global patterns of action. The subregional agricultural policy (ECOWAS, 2008) allows new and more efficient interventions than just isolated national policies and programs. More effort is required to grasp the immense potential for economy, society and biodiversity by assisting small-scale farmers in using their inherent potentials and developing the rural space and, with it, the urban space. We believe that ways to further develop organic and related forms of sustainable agriculture and food systems as hyper-modern[6] in dealing with multi-functional challenges will prove beneficiary for West Africa as it did for Europe so far. Healthy people and watertables, reduced

[6] Hyper, because it has the potential to optimize the various trade-offs of world society (economy, politics, society, science, law, education, natural environment etc) and overcome some of its major well-known weaknesses.

pollution by herbicides, increased biodiversity and limited economic risks for the farm "enterprises" are universal values. Organic food and agriculture are still in the making and it will be accelerated through appropriate laws, politics, economic and scientific and societal operations. It is noteworthy that the ecological and economic leading European societies have fast-growing organic industries and systems, driven by the demand of consumers and citizens. The creativity, determination and curiosity of the self-organized farmer groups, supported by research and extension, provide effective innovation based on local resources. The groups have the potential to stimulate the larger cotton communities and to fertilize new emerging innovation platforms. Policy as well as the economy can be informed and reshaped if the stakeholders of innovation platforms supported by sound scientific practice function well. The enduring solidarity at global level and the needed financial support for such operations is, of course, still required.

References

ADEKUNLE, A. A. E. A. 2012. Approaches for Setting-up Multi-Stakeholder Platforms for Agricultural Research and Development. *World Applied Sciences Journal* 16**,** 981-988.

BOUAGNIMBECK, H. 2013. Latest Developments in Organic Farming in Africa. *The World of Organic Agriculture. Statistics and Emerging Trends. FiBL-IFOAM Report.* [Online].

ECOWAS 2008. Regional Agricultural Policy for West Africa. ECOWAP. Make agriculture the lever of regional integration. ECOWAS Commission.

FAO 2012. Greening the Economy with Agriculture. FAO.

IAASTD 2009. Agriculture at a Crossroads. International assessment of agricultural knowledge, science and technology for development (IAASTD): global report (eds McIntyre, Herren, Wakhungu, Watson et al).

LATOUR, B. 2005. *Reassembling the Social: An Introduction to Actor-Network-Theory*, OUP Oxford.

LUHMANN, N. 1995. *Social systems*, Stanford University Press.

NICOLAY, G. L., BAKER, B 2012. Challenges and opportunities for organic research and extension. *Rural 21*.

PAY, E. 2009. The market for organic and fair-trade cotton fibre and cotton fibre products. FAO.

SCIALABBA, N. E.-H. & MÜLLER-LINDENLAUF, M. 2010. Organic agriculture and climate change. *Renewable Agriculture and Food Systems* 25**,** 158-169.

SWEDBERG, R. 2012. Theorizing in sociology and social science: turning to the context of discovery. *Theory and Society* 41**,** 1-40.

UNCTAD (ed.) 2008. *Organic Agriculture and Food Security in Africa*, New York and Geneva: United Nations.

WILLER, H. A. K., L 2013. The World of Organic Agriculture. Statistics and Emerging Trends. FiBL-IFOAM report. Research Institute of Organic Agriculture (FiBL, Frick and International Federation of Organic Agriculture Movements, Bonn.