

AGRO-ECOLOGY: CAPITALIZATION OF EXPERIENCES IN WEST AFRICA

Factors that further or limit the development of agro-ecological practices
Evaluation of the socio-economic and agro-environmental effects

As in other regions of the world, family farming in West Africa is faced with persistent economic, social, and ecological challenges and difficulties. The Green Revolution model—based on increased usage of synthetic inputs (pesticides, fertilizers), commercial varieties with high-potential yields, and often expensive technologies—does not seem able to provide sustainable solutions adapted to the needs and capacities of peasant families. Yet, these peasant families play a decisive role in the region's food security, even if it does remain fragile. It is within this background that the agro-ecological transition in the region is being promoted and supported, with the aim of **helping to overcome the many difficulties encountered by family farmers**. These difficulties include the following especially: fertility crisis; climate constraints; weakness and irregularity in yields; lack of production enhancement; and, ultimately, the low level of agricultural income and the lack of appeal of agriculture for youth.

Whether it be at the regional or national level, a certain skepticism remains in West Africa concerning the relevance and feasibility of the development of agro-ecology as a suitable response to the big challenges mentioned above. Despite previous experience and development of numerous agro-ecological practices, and even though a variety of one-off scientific studies had been conducted, up to now there have been no **structured benchmarks** produced with a common and reliable methodology accessible to development stakeholders. These benchmarks must deal with the agronomic, socio-economic, and environmental effects and impacts of these practices, as well as the drivers and obstacles to their development.

Within the framework of the CALAO project, various NGOs and universities carried out evaluation and capitalization work in 2017, based on a common

methodology. CALAO's goal is to make the following available for practitioners, political bodies, and development cooperation institutions:

- reference information on the **agro-environmental and socio-economic effects and impacts** of agro-ecological practices and systems, as well as
- partial analysis of the **obstacles and drivers** for developing agro-ecological practices and systems, so as to stimulate dialogue among stakeholders as well as their reflections and decisions.

The CALAO project **(Capitalization of stakeholder experience for the development of resilient agro-ecological techniques in West Africa)**

The CALAO project was coordinated by Agronomes et Vétérinaires Sans Frontières (AVSF) and implemented by the associations AVSF, Gret, CARI, Agrisud International, ENDA Pronat (Senegal), ARFA (Burkina Faso), RAFIA, and Inades-Formation (Togo), as well as Université Cheikh Anta Diop (UCAD, Dakar), Université Nazi Boni (UNB, formerly UPB), Ecole Supérieure d'Agronomie du Togo (ESA-UL), and the association Inter-réseaux Développement rural. The study was also supported through a partnership with the Compared Agriculture and Agricultural Development Training and Research Unit of Agro-ParisTech. The study was implemented within the framework of the PASANAO (Support for Food Security in West Africa) project, which is funded by AFD and for which ECOWAS is the contracting authority. The CALAO project was co-funded by AVSF, Gret, Agrisud, and CARI.

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STUDY METHODOLOGY AND EXECUTION

The study methodology is based on:

- a **diagnostic analysis of the agrarian system**, making it possible to identify, characterize, and modelize farm types and farming systems;
- supplementary methodological aspects for the characterization of agro-ecological practices and their economic assessment, enabling the **comparison and modelization of types and subtypes of farming systems**, according to the degree to which agro-ecological principles and practices are incorporated;
- **specific methods stemming from agronomy, soil sciences**, and life sciences for evaluating the effects of agro-ecological practices on agricultural yields, soil fertility, and wooded vegetation cover and biodiversity. This aspect of the evaluation focused on rainfed crop systems, mainly at the cultivated plot level, along with some measures at the village level concerning wooded cover.

Based on this methodology, three specific studies were conducted in the Sudan-Sahel region, in **Burkina Faso** (East region), **Senegal** (Serer country), and **Togo** (Savanes Region). To complement the research results, a regional seminar was held in Dakar in October 2017 to highlight findings from similar studies.

AGRO-ECOLOGICAL PRACTICES AND SYSTEMS

The study helped identify different **types of agro-ecological practices** existing in the region: diversification, cropping associations and sequences, agroforestry, crop and livestock integration, management and conservation of soils and water, biological control and other pesticide alternatives, and peasant seeds. Some of these practices are **traditional** practices, while others are **more recent innovations** that may either have peasant origins or be promoted by outside organi-

zations (research institutes, producer organizations, or NGOs). Besides practices, it was possible to identify **types of farming systems** incorporating agro-ecological principles and practices.

FACTORS THAT FURTHER OR LIMIT THE DEVELOPMENT OF AGRO-ECOLOGY

Various types of factors that further or limit the development of agro-ecology were found. These were factors related to:

- The **objectives of farmers**, who may or may not find short-term interest in implementing agro-ecological practices.

- The **knowledge and know-how specific to agro-ecology**, which are quite different from those related to agriculture stemming from the Green Revolution. The development of agro-ecological practices is made more difficult when, locally, the transfer of traditional knowledge and know-how is discontinued, or when the practices promoted by outside organizations seem too complex.

- **Demands in labor**. This is because agro-ecological systems tend to be more labor-intensive, especially in the investment phases. Starting up a growth process following the production of organic matter often represents a major difficulty.

- **Agro-environmental conditions**. These are often quite unfavorable for the production of **organic matter**, especially in dry zones. Water availability can also be a restriction for irrigation, food for animals, and composting.

- The production and management of **organic matter**, which represents a key element for the agro-ecological transition (fodder, manure, organic matter in soils). Starting up a growth process following production of organic matter is often a major difficulty.

- The **economic conditions and environment**. Availability of and access to production capital (livestock,



Support for donkey cart equipment in the north of Togo as a drivers for smallholder farms to develop agro-ecological practices (mean of transport for biomass, organic manures, stones for plots development...)

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carts and other equipment, trees) are a key factor in the agro-ecological transition. Conditions of access to markets and services are also important.

– **Access to land and natural resources.** The feasibility of the agro-ecological transition largely depends on the possibilities of protecting crop residue, crops covering the ground during the off-season, and young trees from utilization of grazing rights.¹ It also depends on the degree of security with which farmers can benefit in the long term from the investments they have made in the eco-system (e.g. trees or soil fertility).

– **Public policies,** which may or may not be favorable to the development of agro-ecology.

– The **intervention methods and systems** of the institutions in charge of agricultural counseling and of other organizations (NGOs and producer organizations), which must be long-term participative actions adapted to local situations.

1. Traditional rights of livestock owners to let their animals graze farmland after farmers have harvested.

systems. These conditions may be socio-economic, agro-environmental, institutional, political, and/or cultural.

SOCIO-ECONOMIC EFFECTS AND IMPACT

The study helped to highlight the **positive effects of certain agro-ecological practices** (e.g. the use of manure) **on farmers' income** and to modelize this effect. However, it was not possible to make a precise assessment of the actual effect of a particular practice, due both to the fact that the various practices are interwoven and to the study system used (see below regarding the difficulties and limits of the study). Furthermore, the comparison and modernization of different **farming systems** help to highlight the **positive effect on agricultural income enjoyed by those who incorporated agro-ecology principles more.** In some situations, the effects found were **considerable**, with agro-ecology enabling families to generate income per family worker that was two or four times higher than that of other families, for an equivalent surface area. This was, for example, the case of systems with strong integration between crops and livestock in Senegal. The families concerned can in this way avoid economic, social, and ecological crisis situations that concern many West African family farms. These positive effects also help generate dynamics of development.

Certain types of farms and farming systems identified in this agrarian system diagnostic analysis were found to be more favorable to the development of agro-ecological practices and systems. This is the case of systems in which there is strong integration between crop and livestock activities characterized by both of the following:

– **fodder crops integrated within crop rotations and fodder trees (especially leguminous plants) that help feed a large number of head of livestock, and**
 – **the use of animal manure for fertilizing farm plots.**
 The difficulties and challenges of the agro-ecological transition show that, in cases of traditional farming systems undergoing crisis or of systems stemming from the Green Revolution there is, in addition to changes in particular practices, a need to link the various elements when addressing the conditions for the overall transition towards agro-ecological

Comparison of farm incomes for two farm types characterized by differences in level of integration of agroecological practices

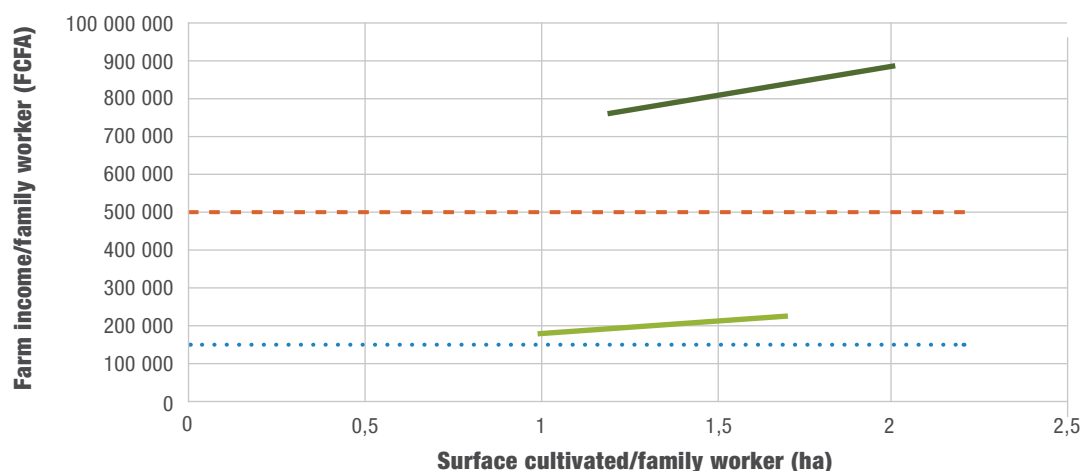


Illustration of the effect of agro-ecological systems on farm income, thanks to the modelization and comparison of two types of farms in the Serer basin of Senegal (type SP5.2 with strong crop and livestock integration vs type SP4.1)

Captions:

— SP4.1 — SP5.2 Survival threshold - - - - Survival threshold

The effects of agro-ecology can be seen not only on farmers' income but also on the generation of wealth from the viewpoint of the entire country, i.e. **value added**.

Positive impacts in terms of **income regularity, food and nutritional security**, and **jobs** were also identified in more qualitatively. For example:

- The diversification of farming activities and the improvement of the ecosystem help to better deal with climate risks.

- The growth and diversification of agricultural production in agro-ecological systems contribute to the population's food security.

- As agro-ecological systems are generally more labor-intensive, they are more likely to contribute to better use of the available labor force throughout the year, or to the creation of jobs.

AGRO-ENVIRONMENTAL EFFECTS AND IMPACTS

In the three fieldwork areas of the study, crop associations and rotations, anti-erosion measures (stone barriers and grass strips in Burkina Faso and Togo), usage of organic manure, and agroforestry are the agro-ecological practices that are known and present in the vast majority of the farms surveyed. However, their level of integration by farmers is still low, as the combination of two or three of these practices concerns not more than 30% on average of the cultivated surfaces of the farms.

The sorghum or millet yields estimated by survey turned out to be 50% higher on average, representing average yields of 1.0 to 1.2 t/ha. In contrast, plots with a low level of integration of agroecological practices had yields of 0,4 to 0,7 t/ha. Concerning maize in the Sudano-Sahelian zone of Togo, the average yield reaches even 3,9 t/ha in plots combining anti-erosion practices and organic fertilization, with a supplement of mineral fertilizer. These results partly explain the positive effects on farm income.

The biggest positive effects of agro-ecological practices concern **organic and mineral fertility of soils**, as well as **carbon capture in soils**, which itself is linked to organic fertility, even if the effect is not always significant. This can probably be explained by the lack of historical perspective compared to the year practices began to be implemented. In Senegal, it was also possible to see the positive impact of agro-ecological practices for tree protection **on reforestation of the landscape and on biodiversity**.

CONCLUSIONS

The considerable potential of agro-ecology and the need for suitable public policies

The study results thus show **strong indications of agro-ecology's potential** for agricultural production, economic and social development (jobs, generation of wealth and income), food and nutritional security, and the regeneration of deteriorated ecosystems in

the West African region. However, analysis of factors that further or limit the development of agro-ecology also shows that such development on a large scale cannot be carried out and be sustainable without **a set of interventions that are consistent with one another**, especially in terms of **public policies**.

Progress, difficulties, limits to the study, lessons to learn in terms of methodology

The methodology that was used made it possible, within the framework of a relatively light system at the scale of each country, to largely respond to the objectives of the study. The results indicated the **importance of having a common methodology** that makes it possible to obtain comparable evaluation results from different regions.² However, some methodological difficulties had a negative influence on the results obtained. The following aspects, for example, will have to be **specified, supplemented, or improved** in the future:

- **Linkage between socio-economic evaluation and agro-environmental evaluation.** Diagnostic analysis of the agrarian system must make it possible to both identify the most relevant agro-environmental variables and indicators in each area studied and to carry out purposive sampling of farms and plots for the agro-environmental evaluation.

- Evaluation of the **effects peculiar to certain practices or sets of practices** promoted by outside organizations. Such an evaluation involves enlarging the purposive sampling of farms and working over greater lapses of time, as well as the existence of benchmarks.

- The evaluation of **compared effects of different levels or different paths of ecological intensification**. This also involves broader purposive sampling of farms and plots.

- The evaluation of impact in terms of **food and nutritional security** and of **jobs**.

- The evaluation of impact in terms of **soil fertility, biodiversity, and vegetation**.

- The evaluation of impact **regionally**, in particular in the case of transfers of fertility between subsets of the region.

For a stronger methodological base, it would be important to carry out this type of study on **more village-level locations in various countries** of West African, so as to obtain study results that can be compared and that correspond to a greater diversity of situations. The public authorities and the various organizations supporting and promoting agro-ecological practices and systems would also benefit from providing themselves with **evaluation systems inspired from the methodology used**, by integrating a broader sample adapted to the questions asked. Such systems, which should be designed before fieldwork, would help evaluate in more detail the effects and impact of the practices and systems promoted.

2. Development of the methodology is one of the main actions of the Group for Agroecological Transitions (Groupe pour les transitions agroécologiques - GTAE) composed of Agrisud, AVSF, CARI and GRET.